Proceedings of the 3rd International Conference on Modern Technologies in Oil and Gas Industries (ICMTOGI 2024)

"The prosperity of oil and gas industries is a central aim that can be achieved by scientific, academic, and modern technology professionals."

This was the theme of *The First* and *Second International Conference on Modern Technologies in Oil and Gas Industries*, and it is extended to the third version of the conference.

The Third International Conference on Modern Technologies in Oil and Gas Industries (**ICMTOGI2024**) is a platform for experts to share their knowledge in the oil and gas fields. This event aims to accelerate scientific discoveries and bring together researchers, scientists, and scholars to exchange ideas and sophisticated research works and share their skillfulness in the field.

(ICMTOGI2024) is designed to be an established event, attracting worldwide participants, and intent on exploring and sharing new pathways of the oil and gas industries.

ICMTOGI 2024

The 3rd International Conference on Modern Technologies in Oil and Gas Industries March 6-7, 2024 Sulaymania

Supervising Committee

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Dr. Rand Qusay Kadhim	Midland Refineries Company

Dr. Rahman AlMusafir	Briyor Science Company , USA
Dr.Dhiaa Yasir Aqar	Ministry of Oil ,Oil Well Department
Dr.Mustafa Muhammed Kadhim	AlKut University College
Dr.Ali Saad Alwan	AlKut University College
Lect. Aleaa Essam Mahdi	Chemical Eng. Dept., University of Technology
Asst. Prof. Dr. Hayder AbdulKarim Muhsin	Chemical Eng. Dept., University of Technology

Invited Speakers

Professor Dr Hussain H. Al-Kayiem	Director of Academic and Research Services, Malaysia
Mahdi Hajimohammadi	Faculty of Chemistry, Kharazmi University, G. C, Mofateh, Tehran
Prof. Dr. Robert Amin	Edith Cowan University - Australia

Congress Journals

Petroleum Chemistry

Russian Applied Chemistry

Invited Speakers Biography

Professor Dr. Hussain H. Al-Kayiem

Completed his BSc, 1973; MSc, 1981 in Mech. Eng. from the University of Baghdad, Ph.D. from the University of Bradford-UK in 1989. He was appointed as the head of the Mech. Eng. Dept. in the Military College of Engineering – Baghdad for 1990-1997. From 1999 to 2003, he headed the Mech. Eng. Dept. in Al-Mustansirya University, Baghdad. He operated as the manager of the Netherlands Engineering Consultants, NEDECO - Iraq branch 2003-2005. Prof Hussain joined Universiti Teknologi PETRONAS (UTP) in Malaysia in 2006 till Feb 2023.

As a Thermo-Fluids and Energy Technologies leader, he has published more than 300 research papers, 10 books, and 15 chapters. He supervised over 75 PGs; 72 have graduated, and 3 are ongoing. He secured and granted 13 Intellectual Property of innovated products.

He is the founder Solar Thermal Advanced Research Center (STARC) and heading the Green Tech Working Group in Malaysia Education and Research Network (MYREN).

Curently, he is the director of ACARES – Malaysia for Academic and Research Services.

Prof. Hussain has been awarded at different national and international levels for his innovative achievements in the energy sector. He was awarded the Special Energy and Environment INNOVA2010 award – Brussels; and a special award from the Polish Inventor and Rationalized Institute in 2011. For his distinguished academic achievements, Prof. Hussain has conferred the 'Eminent Scientist Award' of Wessex Institute – the UK in 2016. And for his outstanding scientific contributions, he has been appointed as a research fellow of Wessex Institute of Technology-UK, a research fellow of the Center of Excellence for Advanced Research in Fluid Flow, CARIFF-UMP and a research fellow in the Power Generation Research Centre, PGRC - UNITEN. He is an editor and editorial board member of three international journals and the Engineering journal – UTP platform editor.

Biography of Mahdi Hajimohammadi

He was born in 1980 in Ghazvin, Iran. He completed his high school in Ghazvin. Then he went to Shahid Beheshti University in Tehran and completed BSc, Ms and PhD in Shahid Beheshti University during 1999-2011. The title of his PhD Thesis was "Photooxygenation of hydrocarbons by molecular oxygen in the presence of porphyrins, metalloporphyrins and chlorin sensitizers under Visible Light Irradiation with Fluorescent Lamp under supervision of Prof. Dr. Nasser Safari. Currently, he is assistant professor of Kharazmi University and he has been supervisor of more than ten postgraduate students until now. Also, he has completed two post-doctoral in University of São Paulo (USP) Brazil and University of Johannes Kepler, linz, Austria.

In addition, his research interest are Dyes and pigments, Photochemistry, Homogeneous and heterogeneous catalysts, Reactive Oxygen Species (ROS), Surface chemistry, Food chemistry and Antioxidants, Photosensitizers, Environmental chemistry/biochemistry, Organometallic chemistry, Photodynamic therapy, Photobiochemistry, Solar energy, Phytochemistry, Green chemistry, Biomimetic reactions, Organic/inorganic hybrid materials, Food Chemistry and toxicology.

Professor Robert Amin

Professor Robert Amin is an adjunct professor at KUST and Edith Cowan University in Australia. He is also the CEO of Zana Enterprise, providing consultation to numerous international oil and gas companies.

Professor Robert Amin is an adjunct professor at KUST and Edith Cowan University in Australia. He is also the CEO of Zana Enterprise, providing consultation to numerous international oil and gas companies.

Robert is a recognized world leader in the field of oil and natural gas processing, pioneering a novel method for the transportation of natural gas to remote regions in the form of gas hydrate. He initiated and developed the LNG Micro-Cell Technology for gas liquefaction. Robert held the inaugural Chair of the Woodside Research Foundation and a Chair in Petroleum Engineering at Curtin University.

He won the National Eureka Engineering Innovation Priz

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

6th March 2024 | 9:30 AM - 4:00 PM | KUST Campus, D- Building, Conference Hall

9:30 - 10:00	Registration
10:00 - 10:20	Opening Ceremony
10:20 - 10:30	Speech | Prof. Dr. Salahalddin Saeed Ali, Komar University of Science and Technology, President.
10:30 - 10:40	Speech | Prof. Dr. Ahmed Mohammed Hassan Al-Ghaban, University of Technology Iraq, President.
10:40 - 10:50	Speech | Prof. Dr. Hasan Shakir Majdi, Al-Mustaqbal University, President.
10:50 - 11:00	Speech | Prof. Dr. Khalid Ajmi Sukkar, University of Technology Iraq, Head of Chemical Engineering Department
11:00 - 11:20	Keynote Speaker | Prof. Dr. Hussain H. Al Kayiem, Director of Academic & Research Services Sdn. Bhd. -Malaysia.
11:20 - 11:40	Keynote Speaker | Prof. Dr. Mahdi Hajimohammedy, Kharazmi University - Iran
11:40 - 12:00	Keynote Speaker | Prof. Dr. Robert Amin, Edith Cowan University - Australia
12:00 - 13:00	Lunch Break (University Cafeteria)
13:00 - 14:45	Research Sessions (E- Building)
14:45 - 15:00	Coffee Break
15:00 - 16:00	Research Sessions (E- Building)

7th March 2024 | 9:00 AM - 1:00 PM | KUST Campus, D- Building, Conference Hall

9:00 - 10:30	Research Sessions (E- Building)
10:30 - 10:45	Coffee Break
10:45 - 12:00	Research Sessions (E- Building)
12:00 - 13:00	Closing Ceremony and Certificates
13:00 - 14:00	Lunch Break (University Cafeteria)

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 1, Session 1, 6th March 2024

13:00 AM - 4:00 PM

KUST Campus, E- Building, Room E-105

Session Topic: Catalysis technologies, chemical additives, & substitutes

Session Chair: Prof. Dr. Jamal M. Ali

Session Co-chair: Prof. Dr. Asawer A. Al-Wassiti

No.	Paper ID	Authors	Title	Time
1	RN1007	Fouad Kadhim Mahdi	The important of tungsten in trimetallic heterogeneous (Co-Mo-W/ γ-Al2O3) catalyst for Hydrodesulfurization of Heavy Naphtha.	13:00-13:15
2	RN1008	Rand Q. Al-Khafaji Duha Kalid Muthana K. AL-Zaidi	Challenges for selective Catalytic naphtha reforming products using Response surface methodology (RSM).	13:15-13:30
3	RN1023	Issam M.A. Shakir Zaineb F. Hassan	New analytical approach for understanding the surface morphology and roughness analysis via atomic force microscopy (AFM) for commercial hydrotreating CoMo-γAl2O3 catalysts.	13:30-13:45
4	RN1024	Kulikova M.V.	New approaches to the formation of carbon-containing catalysts for gas chemistry processes.	13:45-14:00
5	RN1032	Rusul M. Khazaal Dhuha A. Abdulaaima	The recycling of municipal plastic wastes into an alternative hydrocarbon fuel via thermal and catalytic pyrolysis.	14:00-14:15
6	RN1047	Tuqa A. Jabar Mohammed A. Alzuhairi Mayyadah S. Abed	Acidic Influence on Geopolymerization: A Thorough Study Using HCl and Iraqi Kaolin.	14:15-14:30
7	RN1076	Buthainah Ali Maizirwan Mel Riyadh Almukhtar Zahira Yaakob Sany Ihsan Jamal M. Ali Aswar A. Alwasiti	Optimization of Syngas Production from Catalytic Decomposition of Biogas over Al2O3 Supported Nickel based a Lobe Coral Sponge Catalysts using Central Composite Design.	14:30-14:45
8	RN 1085	S. A. Svidersky Y. V. Morozova M. I. Ivantsov A. A. Grabchak M. V. Kulikova A. L. Maksimov	Features of the fischer-tropsch synthesis on iron-containing nanoscale catalysts based on chitosan	14:45-15:00
			Coffee Break	15:00-15:15

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 1, Session 2, 6th March 2024

13:00 AM - 4:00 PM

KUST Campus, E- Building, Room E-107

Session Topic: Wastewater treatment and environmental pollution in oil and gas industries

Session Chair: Prof. Dr. Thamer J. Mohammed

Session Co-chair: Prof. Dr. Amer Aziz Abdulrahman

No.	Paper ID	Authors	Title	Time
1	RN1004	Ali Hattab Alminshidawi Warqaa Abdulredha Alshimmary	Prediction and reducing of heavy metals from refinery waste water in iraq and its environmental impacts.	13:00-13:15
2	RN1013	Ahmed Y. Radeef Aya A. Najim	Integration of microbial fuel cell and vertical biofilter as a sustainable and environmentally friendly technique for bioenergy recovery and treatment of actual refinery wastewater.	13:15-13:30
3	RN1016	Marwah A. Al- Nuaim Asawer A. Al-Wasiti Zainb Y. Shnain	The combined effect of photo catalyst and gas bubble on BTEX On BTEX removal, kinetic, adsorption and optimization study.	13:30-13:45
4	RN1019	Muhammad Aiyd Jasim	Investigating the effectiveness of electrocoagulation technology for removing COD from real oily wastewater: RSM-BBD approach.	13:45-14:00
5	RN1022	Eman Hashim Khader	Synthesis of ecofriendly nanocatalyst and its application for photocatalytic degradation of organic pollutants in petroleum refinery wastewater.	14:15-14:30
6	RN1027	Younis Rasheed Taha Adel Zrelli Nejib Hajji Qusay Alsalhy	Modification of PPSU membranes using water-soluble polymeric nano additive in ultrafiltration membranes.	14:30-14:45
Coffee Break				14:45-15:00
7	RN1030	Husham M.Al-Tameeemi Khalid A. Sukkar Ali H. Abbar	Comparative study of COD removal from petroleum refinery wastewater by anodic oxidation using SnO2 and graphite anodes.	15:00-15:15
8	RN1033	Ghaidaa M. jaid Adnan A. AbdulRazak	Mixed matrix membranes (MMM) for wastewater applications.	15:15-15:30
9	RN1034	Samraa R. Khalil Salah S. Ibrahim Qusay F. Alsalhy	Preparation of hydrophobic membrane for water desalination by membrane distillation.	15:30-15:45
10	RN1042	A. K. Ghyadh J. H. Hemeidan Farah. T. Jasim Al-Sudany	Study coagulation pretreatment of back wash water by new composite poly-aluminum-ferric-sodium alginate-chloride coagulants with composite poly-aluminum-ferric-silicate-chloride coagulants for treatment.	15:45-16:00

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 1, Session 3, 6th March 2024

13:00 AM - 4:00 PM

KUST Campus, E- Building, Room E-108

Session Topic: Modeling, optimization, and process control in oil and gas industries

Session Chair: Prof. Dr. Zaidoon Mohsin Shakor

Session Co-chair: Dr. Ramiz M. Shubbar

No.	Paper ID	Authors	Title	Time
1	RN1009	Safa Khalaf Ali Atiyah Ahmed Yaseen Mohammed S. Ahmed Buthainah Ali Al-Timimi Ali Hassan	Design of a Ratio Control Algorithm for a Fluid Catalytic Cracking System in a Universal Oil Product Context	13:00-13:15
2	RN1010	Safa Khalaf Ali Atiyah Ahmed Yaseen Mohammed S. Ahmed Buthainah Ali Al-Timimi Alaa Khudhair Abbas	Control Techniques Comparison for Fluid Catalytic Cracking Unit	13:15-13:30
3	RN1021	Nabeel Ibrahim Hasan	Najaf refinery unit 2 heat exchangers rating using ASPEN HYSYS - case study.	13:30-13:45
4	RN1025	Saja Mohsen Alardhi Alaa Abdulhady Jaber Laith Majeed Al Saedi	Artificial neural network for predicting oil content in produced water from an Iraqi oil field.	13:45-14:00
5	RN1035	Ammar Mohammed Ali Gaidaa saeed Mahdi Nahla fadel alwan	Using the internet of things in the oil and gas industry.	14:00-14:15
6	RN1037	Mohammed H. Mukhsaf	Short-term load forecasting in refineries: a comparative study of dual machine learning techniques.	14:15-14:30
Coffee Break				14:30-14:45
7	RN1064	Osamah N. Hasan Khalid A. Sukkar Nabil M. Alawi	Contribution of distributed temperature sensing (DTS) for fire and leak detection processing in the petroleum pipelines using fiber optics: A review	15:00-15:15
8	RN1074	Iltifat Hameed Saud	Simulate and optimize the crude oil distillation unit by applying aspen HYSYS.	15:15-15:30
9	RN1077	Hind A. Sami Raheek I. Ibrahim Manal K. Odah Basim SH. Naeem	Fouling and corrosion control of steam boiler tube using PLC system.	15:30-15:45
10	RN1079	Hayder A. Al-Atabi	Advanced materials calculations for methane dissociation over Ni (111) surface using density functional theory.	15:45-16:00
End of Day One				

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 1, Session 4, 6th March 2024

13:00 AM - 4:00 PM

KUST Campus, E- Building, Room E-109

Session Topic: Nanotechnology application in oil and gas industries

Session Chair: Prof. Dr. Zainab Yousif Shnain

Session Co-chair: Dr. Sardasht Sardar Wali

No.	Paper ID	Authors	Title	Time
1	RN1006	Mohammed T. Naser Asawer A. Alwasiti Riyadh S Almukhtar Mazin J. Shibeeb	Influence of nanoparticles on emulsion stability, rheology, energy consumption and mobility of east Baghdad crude oil	13:00-13:15
2	RN1014	Ihab S. Hassan Rana R. Jalil	Combination of nanoparticles and microwave technologies for extraction of oil from carbonate rock.	13:15-13:30
3	RN1015	Firdos M. Abdulla Zainab Y. Shnain Asawer A. Alwaisit Mohammed F. Abid	The use of synthetic iron oxide-doped titanium dioxide nanoparticles in photocatalytic degradation of (BTX) from petroleum wastewater/ produced water.	13:30-13:45
4	RN1060	Seroor Atallah Khaleefa Ali Zaidun Naji Abudi Mohammed Nsaif Abbas May Ali Alsaffar Nermeen Abdulwahab Thekra Atta Ibrahim	Synthesis of nano-silica particles using eucalyptus globulus leaf extract and their innovative application as an adsorbent for malachite green dye.	13:45-14:00
5	RN1069	Baquir Salah Nuri	An update review of utilizing nanofluids as automotive radiator coolants: a promising approach for enhanced heat transfer.	14:00-14:15
Coffee Break				14:15-14:30

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 1, Session 5, 6th March 2024 — 13:00 AM - 4:00 PM

KUST Campus, E- Building, Room E-110

Session Topic: Technology of petroleum refining processes

Session Chair: Prof. Dr. Alaa Dhari — Session Co-chair: Dr. Mustafaa Mohamad Kazim

No.	Paper ID	Authors	Title	Time
1	RN1005	Omar M. Waheeb	Advantages and disadvantages of connect anti surge system gas pipe of multi stage centrifugal recycle gas compressor with process heat exchanger in power former unit Daura refinery.	13:00-13:15
2	RN1028	Mustafa G. Hasan Bashir Y. Sherhan Zaidoon M. Shakor	Preparation of high-efficiency greases using various porous solids as thickening agents for Iraqi lubricating oils.	13:15-13:30
3	RN1031	Salam Hussein Rasheed	A comparison study of removing soluble benzene and toluene from aqueous solution via pervaporation process	13:30-13:45
4	RN1038	Ali Hussein Khalaf Ghassan Husham Jani	Evaluation the Effectiveness of Biopolymers as WAG agent for EOR in Heterogeneous reservoir	13:45-14:00
5	RN1039	Yong Xiao Bo Kang Jian Zhang Hehua Wang Zhongrong Mi Yi Cheng	An Integrated Geology-Reservoir-Engineering Acid Stimulation Solution Unlock the Production Potential in Low Permeability Carbonate Reservoir in Central Iraq	14:00-14:15
6	RN1040	Fadhl hashim Faraj	Enhancing heat transfer in gas-solid fluidized bed systems through copper coatings on glass beads.	14:15-14:30
Coffee Break				14:30-14:45
7	RN1046	Aqeel Al-Adili Ayat Ahmed Luma H. Mahmoud Attia M. Attia Mohamed Mansour	Well Log Analysis and Interpretation for Mishrif Formation for Amarah Oil Field	14:45-15:00
8	RN1051	Jamal M. Ali Abbas J. Sultan Zahraa W. Hasan Nabil Majd Alawi	An experimental assessment of using different sizes of immersed heating surfaces on heat transfer coefficient in gas-solid fluidized bed reactor.	15:00-15:15
9	RN1054	Dalia S. Makki Hasan Sh. Majdi Amer A. Abdulrahman Abbas J. Sultan Laith S. Sabri Haydar A. S. Aljaafari Bashar J. Kadhim Muthanna H. Al-Dahhan	Impact of industrial heat exchanger on flow regime identification in bubble and slurry bubble columns for fischer tropsch application.	15:15-15:30
End of Day One				

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 1, Session 6, 6th March 2024

13:00 AM - 4:00 PM

KUST Campus, E- Building, Room E-111

Session Topic: Corrosion and selection of suitable metals in oil and gas industries

Session Chair: Dr. Husam Ahmed Abdul-Husain

Session Co-chair: Dr. Ahmed A. Ghane

No.	Paper ID	Authors	Title	Time
1	RN1011	Ibrahim Altayer Hassan M. Raheem	Metallurgical failure analysis: a case study of observing a leak in an SS304 pipe.	13:00-13:15
2	RN1018	Karrar I. Mohammed Muhannad Al-Waily Ammar M. Abdulhussen	An investigation into the erosion-corrosion distribution of the tubes supports in the furnaces of oil refineries.	13:15-13:30
3	RN1045	Zenaa I. Jasim Khalid H. Rashid Anees A. Khadom	Corrosion and corrosion control of the steel in acidizing oil wells processes: An overview of organic inhibitors.	13:30-13:45
4	RN1048	Abeer A. Radhi Sami I. Jafar Al-Rubaiey Shaymaa Al-Rubaye	Synthesis and electrochemical behavior of a novel anticorrosion nanomaterial coating carbon fiber (CF).	13:45-14:00
5	RN1052	Mina.S. Nsaif Ahmed S. Abbas Iman Adnan Annon	Corrosion behavior of carbon steel electroplated with nickel-copper layers used in petroleum applications.	14:00-14:15
Coffee Break				14:30-14:45
6	RN1059	Saja Mohsen Alardhi	The effect of annealing temperature on the prepared nano structure CuO using sol-gel method.	14:45-15:00
7	RN1071	Jamal M. Ali Basheer A. Abdulhussein Hajir Amer Jaddoa	A review of corrosion inhibition of carbon steel using fruit, vegetable and rice peel extract.	15:00-15:15
End of Day One				

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 2, Session 1, 7th March 2024

9:00 AM - 12:00 PM

KUST Campus, E- Building, Room E-105

Session Topic: Wastewater treatment and environmental pollution in oil and gas industries

Session Chair: Asst. Prof. Dr. Ako Rashed Hama

Session Co-chair: Asst. Prof. Dr. May Ali Muslim

No.	Paper ID	Authors	Title	Time
1	RN1044	Safiaa M. Mohammed Khalid A. Sukkar	Sequential improvement in degradation of organic pollutants in wastewater by employing ozonation technology in bubble column reactor: A review.	9:00-9:30
2	RN1050	Rana I. Raja Khalid T. Rashid M. A. Toma	A Novel Polyethersulfone/Chamomile (PES/Chm) mixed matrix membranes for removal methylene blue (MB) dye.	9:30-9:45
3	RN1053	Maryam Y. Ghadhban Khalid T. Rashid Adnan A. Abdulrazak Israa Taha Ibrahim Qusay F. Alsalhy	Fabrication, characterization of a novel (PLA/PBAT/green nanoparticles) ultrafiltration membrane for oily wastewater treatment.	9:45-10:00
4	RN1058	Mohanad Mohammed Mahdi	BiOBr synthesis, characterization and photo-catalytic degradation under visible light irradiation: A comprehensive review.	10:00-10:15
5	RN1063	Athba Sabhan Khalaf Zainab Y. Shanain Mohammad F. Abid	Adsorption and photocatalytic degradation of toxic pollutants in wastewater.	10:15-10:30
Coffee Break				10:30-10:45
6	RN1075	Zainab Emad Taki Adnan A. Abdulrazak Qusay F. Alsalhy	MXene-Based Membranes for wastewater treatment	10:45-11:00
7	RN1082	Saja A. Alattar Khalid A. Sukkar May A. Alsaffar	Phenol mineralization from wastewater in petroleum refineries by managing flow characteristics and nanocatalyst in ozonized bubble column	11:00-11:15

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 2, Session 2, 7th March 2024

9:00 AM - 12:00 PM

KUST Campus, E- Building, Room E-107

Session Topic: Technology of petroleum refining processes

Session Chair: Asst. Prof. Dr. Malik M. Mohammed

Session Co-chair: Asst. Prof. Dr. Hiwa Sidiq

No.	Paper ID	Authors	Title	Time
1	RN1056	Ali H. Whaieb Saad A. Mohammed Abbas J. Sultan Bashar J. Khadim Laith S. Sabri Adil S. Hamadi	Investigation the effect of adding linear alkyl benzene sulfonate (labs) on the extraction aromatics from base oil by using Furfural solvent.	9:00-9:15
2	RN1066	Wasan A. Mohsen Basma A. Badday Jamal M. Ali Abbas J. Sultan Zahraa W. Hasan	Influence of heat exchanging tubes on local heat transfer coefficient in fluidized bed reactor.	9:30-9:45
3	RN1068	Zahraa Nazzal Hussain Jamal M. Ali Hasan Shaker Majdi Abbas J. Sultan	Experimental and numerical investigations of convective heat transfer intensification by using nanofluids: a review.	9:45-10:00
4	RN1070	Wasan Hamza Hasan	Biodiesel production from macroalgae: A review	10:00-10:15
Coffee Break				10:30-10:45
5	RN1072	Hassan Y. Ali Salih A. Rushdi	General review of developments in microbial fuel cells, their form, substrates, design, and methods of transporting electrons and protons	10:15-11:30
6	RN1081	Wasan S. Mowea Raheek I. Ibrahim Manal K. Oudah	Electromagnetic heating for the separation of water oil emulsion.	11:00-11:15

The 3rd International Conference on

MODERN TECHNOLOGIES IN OIL AND GAS INDUSTRIES

ICMTOGI 2024

Day 2, Session 3, 7th March 2024

9:00 AM - 12:00 PM

KUST Campus, E- Building, Room E-109

Session Topic: Gas emission and treatment in oil and gas industries

Session Chair: Prof. Dr. Qusay F. Alsalhy

Session Co-chair: Dr. Rand Q. Kadhim

No.	Paper ID	Authors	Title	Time
1	RN1017	Buthainah Ali Zahira Yaakob Maizirwan Mel Sany Ihsan Mohd Sapuan Salit Jamal M. Ali Saif Saad Mahdi	Toward a net-zero energy system: Biogas and Biomethane role.	9:00-9:15
2	RN1043	Amjed R. Qarahgouli Khalid A. Sukkar Alaa M. Ali	Current status and future prospects of air quality and management in petroleum refineries.	9:30-9:45
3	RN1049	M. Iezzul Firdaus Yuhana Salam A. Mohammed Laith S. Sabri Firas Basim Ismail	Analytical Prediction of Gas Hydrate Formation Conditions for Oil and Gas Pipeline.	9:45-10:00
4	RN1055	Ali A. Abdulabbas Thamer J. Mohammed Tahseen A. Al-Hattab	Evaluation of polysulfone membranes for CO_2/N_2 separation under experimental conditions.	10:00-10:15 10:15-11:30
5	RN1084	Fenk A. Sulaiman Hiwa Sidiq Aryan A. Ali Mirei Mohamad	Mitigating Liquid Carry-Over and Foaming in a Gas Processing Plant through the Installation of Vertical Scrubbers	10:30-10:45
Coffee Break				10:45-11:00

Invited Speaker

Produced water management in oil production industry by hydrocyclonic separation

Professor Dr Hussain H. Al-Kayiem
Director of Academic and Research Services [ACARAES]

Summary

Water is by far the largest waste stream associated with oil and gas production. It is unimaginable to find an oil reservoir absolutely free from connate water. Separation of water from oil and gas is the oldest practice in the petroleum industry.

When oil is retrieved from underground wells, it is often accompanied by significant amounts of water, called produced water. Produced water refers to the water brought up from the hydrocarbon-bearing strata during the extraction of oil and gas. This water can include formation water, injection water, and any (waste) surfactants added down-hole or during the oil/water separation process. Produced water always contains dispersed and dissolved oil and other varieties of dissolved inorganic and organic compounds, suspended solids such as formation fines, sand, scales and corrosion products. This mixture of oil and water needs to be separated and the water disposed of or re-injected into the reservoir before the oil can be exported to refineries.

Water management has become an important issue of hydrocarbon production, since the produced water increases as a field gets older and because of the dramatically increasing cost of water handling, such as separation and treatment. In addition, the withdrawal of water contributes to the reduction of pressure and water re-injection is required to maintain reservoir pressure in order to enhance oil recovery. Traditionally, large, heavy gravity separators have been used to separate oil and water. Due to the slug flow of the oil/water interface these separators are not stable and separation efficiency is reduced, making it harder to produce only oil at the surface, thus creating economic and environmental challenges.

As the oil concentration changes, such as in oily wastewater containing more than 90% of water, oil content can be as low as 50 ppm or as high as 500 ppm. In some mature oilfield oil content can vary between 2% and 10%, depending on the oilfield's characteristics. The separation process varies based on the oil-water mixture. Most commercially available oil-water separators rely on the gravity movement but this separation method is not effective in less-dense oil in down-hole oil-water separation.

With their compact size, hydro-cyclones can be used to replace large surface gravity separators, both on newly built platforms and existing ones with water- handling constraints that usually occur in mature fields. Liquid-liquid hydro-cyclones can also be used as an integral part of a down-hole oil-water separation system. They created new possibilities for separating fluid down-hole in the producing formation and injecting separated water far away from the production interval.

The cyclone divides the liquid mixture into two streams as oil stream to be lifted to the surface and an oil-depleted water stream to be injected into a disposal zone. Before putting cyclones into operation, one has to investigate fluid properties, well geometry, well completion and characteristics of the formation.

Invited Speaker

Using Solar Energy for oxidation of hydrocarbons

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Summary
The oxidation of hydrocarbons plays an important role in organic synthesis not only in the laboratory, but also at the industrial level.1 In recent years the demands for environmentally benign and eco-conscious chemical processes have also emerged.2 In particular, there has been an increasing interest in the oxidizing properties of organohypervalent iodine reagents.3 Catalytic methods for this reaction are intensively being investigated to replace stoichiometric oxidation processes that generate large amounts of heavy metal and solvent waste.4 In this regard, aerobic oxidation processes have received increasing attention, as oxygen or air are used as the terminal oxidant to replace the stoichiometric metal oxides such as chromates and manganese oxides. Furthermore the use of oxygen has great benefits from both economic and green chemistry viewpoints, because oxygen is relatively cheap and produces water as the only byproduct. Accordingly, varied heterogeneous and homogenous catalysts derived from precious metals have been developed for this purpose,5 but due to their rarity, high price and toxicity, precious metals are sometimes impractical for industrial use of O2 activation.
Metalloporphyrins have been found to be efficient biomimetic catalysts for hydrocarbon oxidation when using molecular oxygen and various oxygen transfer reagents.6 However, finding a catalytic system for hydrocarbon oxidation by O2 under mild conditions is still a challenging issue. Iron porphyrins have been used as catalysts for alkane hydroxylation by O2 while consuming a stochiometric amount of a reducing agent.7 The oxidation of alkanes to alcohols and ketones was performed at 80 ºC under a 10 atm pressure of oxygen. Oxidation of hydrocarbons by metalloporpyrins that have a strong affinity for generation of metal-oxo species (M=O) was investigated with chemical oxidants such as meta-chloperbenzoic acid (m-CPBA).8 The photosensitized production of singlet oxygen has significance in the photooxidation of organic compounds, DNA damage and photodynamic therapy.9 Therefore, a variety of these, photosensitizers have been developed and their photochemical and photophysical properties have been extensively studied.10 Among tetrapyrrolic compounds, such as porphyrins and phthalocyanines, are promising candidates for photosensitizers due to their unique photophysical properties.11

However, if solar radiation and oxygen can be used to mediate the efficient oxidation of hydrocarbons, an environmentally benign process will be established. This concept dates back to the origin of organic photochemistry in the late 19th century, but was not adequately persuaded.

Herein, in continuation of our studies we have reported new and highly efficient system for the aerobic oxidation of hydrocarbones such as alkenes, aldehydes and alcohols to valuable products products by using porphyrins and phtalocyanines as photsensitizers and sunlight

Invited Speaker

Challenges of Implementing Modern Technologies in the Oil and Gas Industry

Prof. Dr. Robert Amin
Edith Cowan University - Australia

Summary

A quick review on emerging new technologies in the oil and gas industry, including Artificial Intelligence and Cloud Computing with focuses on energy efficiency and environmentally friendly technologies such as capturing and storing carbon dioxide.

The challenges facing the industry in implementing modern technologies. On top of these challenges, the potential impact of global decarbonization on the oil and gas industry and the adoption of zero-emission standards around the world, uncertainty about the future of certain part if the industry such as facing out oil and the increases in oil and gas prices pushing the world towards renewable energy and how the oil and gas industry trying to adopt.

Universities are facing the challenge of how to align themself with the rapid emergence of technologies.

RN1004: Prediction and reducing of heavy metals from refinery waste water in Iraq and its environmental impacts

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Abstract:

The aim of the research is to study the traditional and modern methods of the industrial water treatment discarded from the facilities and oil refineries from the heavy metal elements and knowledge and identification of the environmental implications, however, from a recent studies that suggested using of adsorption processes to reduce or remove the heavy metals dissolved in the industrial water discarded from the operation units. This technique was adopted and the process of selecting appropriate adsorbents for this purpose was done through the use of several adsorbent surfaces of fixed origin and others of fixed origin in addition to some sediment. Synthetic material (organics and plants waste) , give it an abbreviated name (D), and at other times, iron (III) Fe deposits are added to it from a solution ($FeCl_3$), where we give the adsorbent common to iron deposits the abbreviation (D.Fe) and others containing aluminum (III) deposits Al from a solution ($AlCl_3$) and we give it the abbreviation (D.Al), as it was noted that these mixtures have a high absorption of dissolved gases in heavy water as a result of the decomposition processes that occur in this water and activated charcoal type (CKT - 3) and surfaces of synthetic D to remove ions of metallic elements from their aqueous solutions of varying oxidation numbers, such as (VI)Cr, (II) Fe, (VII)Mn, (II) Cd, (II)Zn, (II) Cu and others. Where it was observed which adsorbent surfaces are more effective for withdrawing these metals that have high toxicity and fatal danger to humans and the environment. Various adsorption rates were obtained according to the type of materials used and the method of activation, for example, material D. Adsorption rates ranged from (32% for iron to 92% for zinc (Zn) while (D.Al) adsorption rates ranged between (52% for manganese Mn to 98% for zinc Zn) and we obtained adsorption rates for D.Fe material that ranged between (28% for iron deposits -98% for cadmium Cd), while the adsorption rates after the activation of activated carbon in these mixtures were for the material AC.D al It ranged between (92% for iron deposits - 99.6% for zinc Zn) and AC. (DFe) adsorbed between (80% for Cu deposits -100% for iron deposits). From the foregoing, we can say that the creation of a new adsorbent from a group of materials available in nature and cheap and with this effectiveness It is considered both an economic and environmental gain.

RN1005: Advantages and Disadvantages of Connect Anti Surge System Gas Pipe of Multi Stage Centrifugal Recycle Gas Compressor with Process Heat Exchanger in Power Former Unit Daura Refinery (Case Study)

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Abstract:

Gasoline produced by hydro-treating light and heavy naphtha and reforming hydro-treated heavy naphtha, hydrogen required for both processes produced by the reforming unit as a byproduct, compression, and recycling of hydrogen required for reforming reactions provided by recycle gas compressor (centrifugal multi-stages compressor), due to the design criteria of this compressor the anti- surge system pass 18031 kg/h, of hydrogen from discharge to suction of compressor with 3" control valve, at the low flow situation during the startup of the unit to avoid the lake of gas flow and avoid over pressure in the discharge of the compressor. Anti-surge system in this compressor contains no inter-stage cooler, the suction temperature of the compressor is designed at 43℃, and the discharge of the compressor is 79 ℃, when the anti-surge system is involved in the process, the suction temperature of the compressor becomes 70 ℃, and the discharge becomes 108 ℃ due to the heat accumulation of recycle gas out of the anti-surge system. In an aim to solve this problem, the outlet of the anti-surge system of the compressor connected with the process heat exchanger, to cool down the suction of the compressor to approximately 46 ℃ and back to the design limits, the disadvantage of this solution is the absorption of the light end associated with recycle gas posing in the process heat exchanger, which reduces the total molecular weight of recycle gas through the anti-surge system from 13.336 to 10.51kg/kg mol at start of the run, and from 16.155 to 12.15 kg/kg mol at the end of the run.

Keywords: Anti Surge system, Recycle gas compressor, Power former unit

RN1006: Influence of nanoparticles on emulsion stability, rheology, energy consumption and mobility of East Baghdad Crude oil

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Abstract

Emulsion formation is a natural phenomenon since crude oil is constantly produced in conjunction with water from the reservoir. Water-in-oil (W/O) emulsions have been claimed to be the most prevalent form of emulsion seen in the oil and gas industry. It can exhibit high viscosity, leading to challenges during pipeline transportation as well as in oil sector. In this paper, the effect of modified silicon dioxide (SiO2) and magnesium oxide (MgO) nanoparticles with different concentrations (1, 3, and 5) wt.% on the flow characteristics of east Baghdad crude oil emulsion have been investigated with water cut 35%v/v in a 0.0145m inlet diameter and 17.9m length horizontal pipe. The effect of these nanoparticles on the emulsion stability, rheological property, emulsion type, viscosity, and pressure drop as well as energy consumption was also studied. The rheology study found that best results were achieved by using modified nano silica at 1% & 3% addition which resulted in significant reduction of viscosity with shear thinning behavior. The addition of modified nano silica decreased the pressure drop in general and the addition of 3% resulted in higher stable emulsion and pump power consumption.

RN1007: The important of tungsten in trimetallic heterogeneous (Co-Mo-W/γ-Al_2O_3) catalyst for Hydrodesulfurization of Heavy Naphtha

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Abstract:

This study investigates the effect on catalytic activity of inserting tungsten metal(W) into trimetallic W-Mo-Co supported on a Gamma-Alumina (γ-Al_2O_3) heterogeneous catalyst used for hydrodesulphurisation (HDS) in an oil refinery. Bimetallic Co_5Mo_{15}/γ-Al_2O3 and a trimetallic $Co_5Mo_{14}W_1$/γ-Al_2O_3 catalysts were synthesized using incipient wetness impregnation. The synthesized trimetallic $Co_5Mo_{14}W1$/γ-Al_2O_3 catalyst exhibited better catalytic performance, with an 88% hydro-removal percentage of sulfur based on an HDS reaction of petroleum naphtha as compared to the 82% for the bimetallic 5Co-15Mo/γ-Al_2O_3 catalyst under the same operational conditions at a pressure of 11.5 bar, a temperature 598 °K, and a reaction time of 3 hr. This enhanced catalyst activity can be attributed to the presence of tungsten increasing the number of metal sites on the catalyst's reaction surface

Keywords: Tri-metallic catalyst; hydro-desulphurisation; tungsten; heterogeneous

RN1008: Challenges for selective Catalytic naphtha reforming products using Response surface methodology (RSM)

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Abstract

The prediction of catalytic Naphtha reforming products one of the main challenges issues in oil sector. Investigating of Continues Catalytic Reforming (CCR) $C5^{+,}$ H_2, C_1, C_2, C_3, and C_4 achieved by using Research Surface Methodology (RSM). Process can be described in terms of several controllable variables which are RON, Naphthenes and Aromatic. In present work, a quadratic polynomial equation for $C5^+$, H_2 have been obtained by utilizing Response Surface Methodology and results were tested by Design Of Experiment (DOE) and ANOVA analysis, the experimental result shows good agreement with the predicted model, with a yield of $C5^+$ ranging from (77.27 to 109) when the RON is in the range of (68 to 95), Naphthenes vol. % is in the range of (15 to 25) and Aromatics vol. % is in the range of (10 to 30). H_2 yield varies from (0 - 1.37) is significantly affected by increasing $C5^+$ and reduced by decreasing RON. The yield of other products calculated by multiple regression analysis which depended on $C5^+$ conversion range (77-100), yields for other products of reformer (C1, C2, C3, C4) can be calculated from correlation that developed using multiple regression analysis. This case study indicates that the statistical model is useful of Continues Catalytic Reforming (CCR).

RN1009: Design of a Ratio Control Algorithm for a Fluid Catalytic Cracking System in a Universal Oil Product Context

Safa Khalaf Atiyah [1*], Ahmed Yaseen Ali [2*], Mohammed S. Ahmed [3], Buthainah Ali Al-Timimi [4], Ali Hassan [5]

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Abstract:

The objectives of this study were to derive the mathematical model for an industrial Universal Oil Product (UOP) fluid catalytic cracking unit basis on mass and energy balance, and applied ratio controller in two cases (case 1: the position of ratio controller is after the control valve of input air of the regenerator, case 2: the position of ratio controller is before the control valve of input air of the regenerator) to control riser and regenerator outlet temperatures. The fluid catalytic cracking is simulated by using Matlab/Simulink software. The gas oil feed flow rate, gas oil feed temperature and air temperature disturbances are introduced to test the proposed ratio control scheme. The results show that the ratio case one is effective, stable and it's found from IAE values that the setting time to reach to set point of riser and regenerator reactors using ratio controller case one was less than when using ratio controller case two.

Keywords: Fluid catalytic cracking unit, process modeling, ratio controller.

RN1010: Control Techniques Comparison for Fluid Catalytic Cracking Unit

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Abstract

The present study deals with the simulation of an industrial Universal Oil Product (UOP) fluid catalytic cracking unit using Matlab/Simulink. The simulation program is based on mass and energy balance of unit. The performance of controller is tested by using the disturbances of the gas oil feed flow rate, gas oil feed temperature and air temperature. The proportional integral (PI) and fuzzy logic controllers are applied. The results show that the integral absolute error (IAE) of fuzzy is less than PI controller. The performance of fuzzy is better than PI controller because the response are stable and setting time is less than when using PI controller.

Keywords: Fluid catalytic cracking unit, Matlab simulation, proportional integral controller, Fuzzy controller.

RN1011: Metallurgical Failure Analysis: A Case Study of Observing a Leak in an SS304 Pipe

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Abstract

This research presents a detailed metallurgical failure analysis of an SS304 pipe that experienced a leak. The investigation aimed to understand the failure mechanism and identify the factors contributing to the corrosion damage. Visual examination, scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS) were performed on the pipe sample. The visual examination revealed the presence of grinding marks, heat tint, and undercuts in the weld seam, indicating potential initiation sites for corrosion under stagnant or low flow conditions. SEM analysis provided high-resolution images of the leak locations, showing the presence of multiple pinholes and tunneling-type damage. The EDS elemental analysis identified significant amounts of corrosive materials. The findings suggest a multifactorial corrosion process involving factors such as stagnant fluid conditions, surface irregularities, bacterial activity, and corrosive compounds. The disruption of the passive oxide layer by chlorine and the accumulation of corrosive elements and microbial byproducts likely contributed to the initiation and progression of corrosion. This study emphasizes the importance of proper inspection, welding practices, and preventive measures to mitigate the risk of corrosion in SS304 pipes. Regular cleaning, disinfection, and monitoring of the fluid medium are essential to control bacterial growth and minimize the accumulation of corrosive compounds. Maintaining the integrity of the protective passive oxide layer and minimizing surface irregularities during welding are crucial for preventing corrosion initiation.

Keywords: metallurgical failure analysis, SS304 pipe, leak, material properties, visual examination, scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS)

RN1013: Integration of Microbial Fuel Cell and Vertical Biofilter as a Sustainable and Environmentally Friendly Technique for Bioenergy Recovery and Treatment of Actual Refinery Wastewater

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Abstract:

The microbial fuel cell (MFC) is an advanced bioelectrochemical system that efficiently generates electric current by harnessing electrons produced during the oxidation of biodegradable organic pollutants by the active biofilm in the anodic compartment. A novel MFC coupled with a biofilter was developed and evaluated for its exceptional performance in treating actual refinery wastewater, known for its high organic content. The MFC featured vertical flow packed bed dual chambers, with a unique three-dimensional packed bed anode utilizing a solid waste material. The study aimed to assess the impact of this innovative design on organic content removal, measured as chemical oxygen demand (COD), and bioelectricity recovery. Impressive results demonstrated the MFC's remarkable removal efficiency for refinery wastewater, while achieving significant power generation. This pioneering approach represents a sustainable, renewable, cost-effective, and environmentally friendly technique for refinery wastewater treatment.

RN1014: Combination of Nanoparticles and Microwave Technologies for Extraction of Oil from Carbonate Rock

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Abstract:

Core samples extraction is one of the main processes before routine core analyses. This process consumes time and chemical solvent so, it is necessary to find new techniques and materials to increase the efficiency of extraction method with less time and chemical consuming. The objective of this research project is to use the microwave and Nanoparticles assisted technologies in the extraction of oil in rock samples. The samples of carbonate reservoir rocks used in this research. Microwave heating can be a powerful tool for thermal treatments because many benefits can be achieved as proofed by previous research. However, an increase in the efficiency of the Nanoparticles assisted microwaves has been demonstrated in the extraction by adding the Nano silica with different weight ratio to the solvent used in the experiments and expose samples to the microwave effect under different powers then compare the results with that of samples treated with microwave only. first, second, and third level headings (first level heading). The experiments showed that the adding 0.1 wt.% of Nano silica reduced cleaning time to approximately 70% less than cleaning by using microwave technique without Nano silica; that can refer to the high efficiency of Nanosilica assistance in rock extraction.

RN1015: The Use of Synthetic Iron Oxide-Doped Titanium Dioxide Nanoparticles in Photocatalytic Degradation of (BTX) From Petroleum Wastewater/ Produced Water

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Abstract

The aim of the work is to investigate the use of synthetic doped catalyst in the removal of BTX from wastewater by photocatalyst process in a circular column reactor. Fe_2O_3-doped anatase TiO_2 with 10 nm average grain size was synthesized by the impregnation method. The prepared doped catalyst was characterized using energy-dispersive X-ray (EDS), scanning electron microscopy (SEM), Surface Area Analysis using the Brunauer-Emmett-Teller (BET), Fourier transforms infrared spectroscopy (FTIR) beforehand with XRD. Then it is evaluated in a photocatalyst process which was done in a circular column with dimensions of 70 mm diameter and 390 mm height, under visible light. The study also shows the influence of pH, light intensity and residence time on the BTX removal. The experiment was carried out under different values of pH (3-11), light intensity (14-42) W and irradiation time (30-120) min. The results show that the maximum removal efficiency was 90% when pH = 7, 42W light intensity and after 120 min. The kinetic model as well as Adsorption isotherm were also studied.

RN1016: The combined effect of photo catalyst and gas bubble on BTEX On BTEX removal, kinetic, adsorption and optimization study

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Abstract

This study aimed to purify produced water (PW) using UV-photo catalysis enhanced by gas bubbles. BTEX (benzene, toluene, ethylbenzene, and xylene) were the target hydrocarbons. A rectangular column with TiO_2 catalyst on an aluminum plate was used, and BTEX removal percentage determined the process efficiency. Gas flow rate (0-3 L/min), pH (3-11), and irradiation time (30-120 min) were varied. The Dubinin-Radushkevich, Freundlich, and Langmuir models analyzed adsorption, with Dubinin-Radushkevich exhibiting the best fit. Kinetic models (pseudo-first order, Elovich, and intra-particle diffusion) showed good agreement. Optimal conditions were predicted using expert design software, and despite deviations, the removal efficiency remained at 93%. The study emphasized the significance of pH, time, and flow rate in designing efficient BTEX removal systems using photocatalysis.

RN1017: Toward a Net-Zero Energy System: Biogas and Biomethane Role

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Abstract

In a future net-zero world, renewable hydrocarbons like biogas and biomethane are essential. Biogas is the main product of the anaerobic digestion (AD) of wet biomass. Locally, biogas can be used for combined heat and power (CHP) or for heating; alternatively, it can be transformed into bio-methane and used in place of natural gas. As a result, there are many ways to use biogas and biomethane on the road to net zero emissions. The circular economy, the energy system, and environmental systems all depend on biogas and biomethane, which are sustainable adaptable systems. As a result, it is one option to reduce the consumption of fossil fuels and advance the development of a net-zero energy system.

Keywords: Biogas; Biomethane; Net-Zero; Anaerobic; Sustainable Energy

RN1018: An investigation into the erosion-corrosion distribution of the tubes supports in the furnaces of oil refineries

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Abstract:

Crude oil is one of the most important energy sources in the world, in order to be converted into its main components, it must be refined. During the refining process, its temperature is raised to approximately 370 ˚c. This paper includes experimental investigation for erosion-corrosion in furnace tube supports of an oil refining unit. Supports material HH metal Cast ASTM: A297, A608 has heat resistant stainless-steel alloy is in a high degree sensitive to balance of composition, containing enough chromium for resistance scaling at high temperature. The furnace can be divided into two regions, the lower zone called the radiation zone and the upper zone called the convection zone. Erosion-corrosion has been studied in longitudinal and transverse tube holders. For clarity, the rows have been divided into five columns the final outcome of the study was that the rate of corrosion increases as move from the radiation region to the region of convection. Where the maximum erosion-corrosion percentage 69.1, 65.8, 69.2, and 60.8 for column1,2,3, and 4 respectively as comparison with standard dimension.

RN1019: Investigating the Effectiveness of Electrocoagulation Technology for Removing COD from Real Oily Wastewater: RSM-BBD Approach

Muhammad Aiyd Jasim

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Abstract

The current investigation attempts to treat real oily wastewater produced from the Al-Muthanna petroleum refinery with a modernized electrocoagulation reactor (ECR) to diminish the chemical oxygen demand (COD) to levels suitable for consumption. In the continuous ECR, a two-sided finned (2SF) cathode tube was situated between two tubular anodes, with the active area of the cathode being significantly more extensive than its immersed volume. Circular aluminum tubes were employed as a sacrificial anode in this procedure, while a stainless-steel finned cylinder was used as a cathode. Each of these electrodes was related to a DC power source in a monopolar-parallel mode. The electrolysis period (4-60 min), current density (0.63-5.0 mA/cm^2), and flow rate (50-150 ml/min) were studied for their effects on COD removal efficiency. Increasing the flow rate reduces COD removal efficacy, but increasing current density and electrolysis time improves it. At optimized values of 60 minutes of electrolysis, 5 mA/cm^2 of current density, and 50 ml/min of flow rate, the removal efficiency for chemical oxygen demand (COD) was 97.18%, with energy consumption of 4.309 (kWh/kg $_{COD}$), theoretical electrodes consumption of 0.550 g, and actual electrodes consumption of 0.68 g. This research validated the new reactor's ability to treat real oily wastewater under operational parameters. It could be used as a precursor to other traditional procedures.

RN1021: Najaf Refinery Unit 2 Heat Exchangers Rating Using ASPEN HYSYS - Case Study

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Abstract

Heat exchanger unit is one of the most important parts in refineries, to ensure the efficiency of heating and cooling process. The improvement of heat exchange not only gives a good refined product, but also decreases the total cost. In this work, we collected heat exchangers data and operating conditions and simulated them in ASPEN HYSYS V12 software to predict heat exchangers performance. Heat exchanger E-211A efficiency ranked at 93.32 %, heat exchanger E-211B efficiency; 19.02 %, heat exchanger E-211C efficiency;10.87 %, heat exchanger E-215 efficiency; 16.92 %, heat exchanger E-216 efficiency; 52.74 % and heat exchanger E-213 efficiency;66.23 %. The resulting data obtained from ASPENHYSYS v12 were used in Aspen Exchanger Design and Rating (EDR). These results refer to multi reasons that affected to decrease heat exchangers performance such as water, salt and sediment contained in crude oil and refinery products. Heat exchangers efficiency maps along-side with production process gave a description to find difficulties and solve them. The optimum operating conditions can be also determined by ASPEN HYSYS as a forward step

Keywords: heat exchanger, refinery, crude oil distillation, Aspen HYSYS

RN1022: Synthesis of Ecofriendly Nanocatalyst and its application for Photocatalytic Degradation of Organic Pollutants in Petroleum Refinery Wastewater

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Abstract

The green synthesis of nanocatalyst is an emerging branch of nanotechnology in recent times, as it has numerous advantages such as sustainability, cost-effectiveness, biocompatibility, and eco-friendliness. In this research, green nanocatalyst (GNC) are prepared by simple thermal technique utilizing the waste of plants to investigate chemical oxygen demand (COD) degradation in the photocatalytic process. The results of the X-ray Diffraction (XRD), Field Emission Scanning Electron Microscopy (SEM), Energy Dispersive X-ray (EDX), Fourier Transform Infrared (FTIR), and Brunauer-Emmett-Teller (BET) analyses indicated that the GNC was synthesized with excellent quality. Factors affecting degradation rates, such as the type of light source and its arrangement, the aeration, pH, catalyst dose, irradiation time, temperature, and initial COD concentration were investigated. Results showed that good COD degradation was achieved under optimal operation conditions. The kinetics of the photocatalytic process are studied. The reaction kinetic follows the pseudo-first-order kinetic model. Therefore, the GNC can be applied as a cost-effective catalyst for the degradation of COD from industrial wastewater to an acceptable standard by the World Health Organization (WHO).

RN1023: New analytical approach for understanding the surface morphology and roughness analysis via atomic force microscopy (AFM) for commercial hydrotreating CoMo-γAl $_2O_3$ catalysts

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Abstract

Atomic force microscopy (AFM) is a versatile tool that widely applied for characterization of surface structure in nano-scale (10nm-100μm), surface roughness and area to provide an essential information of the sample.in this work a fully analytical approach for atomic force microscopy (AFM) (non- contact mode)is proposed to determine surface roughness, morphology, and topography of commercial CoMo-γAl_2O_3 catalysts that are used in hydrotreating process (HTP) in Iraqi refineries. All parameters of the (AFM) image (amplitude, hybride and spatial parameters) were discussed with a new insight and a detailed description of how the nano-particles were built in and distributed in hypothetical multi layers based on mathematical calculations of volume and surface area based on regarding that each individual grain is a complete sphere of given diameter.

Keywords: Atomic Force Microscopy (AFM), Hydrotreating, CoMo-γAl_2O_3 catalyst, Skewness, Kurtosis, Savitsky-Golay smoothing.

RN1024: New approaches to the formation of carbon-containing catalysts for gas chemistry processes

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Abstract

Modern environmental problems are associated with the utilization of carbon-containing raw materials, which can be processed using gas chemistry processes. A large reservoir of technologies is based on processes associated with heterogeneous catalytic systems (hydrogenation of carbon monoxide, catalytic decomposition of methane, etc.), carried out by supported or deposited on a support by metals of group VIII. The support is a standardized component of the catalytic system that directly affects the active sites. The synthesis of supports during the formation of a catalyst allows one to vary a large number of process parameters, which makes it possible to change the characteristics of the system by obtaining various catalytic composites.

The creation of composite materials with the required physicochemical properties is one of the main problems of modern materials science. The developed approaches to the synthesis of materials allow the design and construction of systems with specified characteristics, which opens up great opportunities for the use of methods for the synthesis of catalytic systems with the required parameters. The paper presents the results of the formation of composites by two different methods: the method of matrix isolation and hydrothermal synthesis. Composite materials containing active metal nanoparticles (iron, cobalt, nickel, etc.) immobilized in a carbon-containing matrix based on various polymers (polyvinyl alcohol, cellulose, etc.) were obtained by the matrix isolation method. The activity of the synthesized materials in the processes of catalytic hydrogenation of carbon monoxide into various products - hydrocarbons, alcohols is shown. The activity of composites in the process of catalytic decomposition of methane with the production of hydrogen and nanotubes has been recorded. The influence of the conditions for the formation of catalytic materials on their physicochemical and catalytic properties has been established. It is shown that the formation of the active phase of the catalyst at the stage of composite synthesis, which makes it possible to use composites without the stage of preliminary activation, which is necessary for almost every industrial catalyst. Composite materials based on various carbon-containing systems (glucose,

cellulose, PVA, etc.) and iron nitrate have been formed by the method of hydrothermal synthesis. It is shown that in the process of synthesis, the formation of a composite occurs due to the sorption of iron ions onto a carbon-containing matrix. The activity of materials in the process of catalytic hydrogenation of carbon monoxide has been established.

Varying the conditions and methods for the synthesis of catalytic systems allow influencing the morphology, structure of the metal and carbon-containing components and, as a consequence, carrying out the catalytic design of carbon-containing catalysts for gas chemistry processes. This work was carried out within the State Program of TIPS RAS

RN1025: Artificial Neural Network for Predicting Oil Content in Produced Water from an Iraqi Oil Field

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Abstract

Oily wastewater represents the most significant environmental discharges from gas refineries. In this study, we utilized an Artificial Neural Network (ANN) technique to predict the oil content in the western process. The dataset used to develop the model was collected from an operational plant in Iraq in September 2023 and encompassed various parameters, including the feed water's oily water concentration (ppm), temperature, pressure, and unit flow rate. Despite the substantial parameter variations, our ANN model exhibited remarkable accuracy in simulating the examined process. The training phase yielded a low mean squared error (MSE) of less than $1.55*10^{-7}$, while the testing results demonstrated a high coefficient of determination (R^2) exceeding 0.99."

RN1027: Modification of PPSU membranes using water-soluble polymeric nanoadditive in ultrafiltration membranes

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Abstract

Environmental concerns due to the lack of water resources around the world, particularly those relating to the chemical and biological contamination of water have grown significantly over the past years. Therefore, water resources in this situation need to be constantly protected by using appropriate treatment methods, one of which is membrane technology. In this study, some promising nanocomposite membranes were prepared by adding different concentrations of partially cross-linked nanoparticles graft copolymer (PCLNPG) as additive to the polyphenyl sulfone (PPSU) membrane matrix via the phase inversion method. PCLNPG, a water-soluble nanoadditive, has been effectively utilized as a pore former for membranes modification. The effect of nanoadittive contents on the morphological structure and performance of the prepared membranes was investigated by Field Emission Scanning electron microscopy (FESEM), Fourier transform infrared spectroscopy (FTIR), energy dispersive x-ray (EDX), water contact angle (CA). The results showed that the permeation flux and rejection of Bovine serum albumin (BSA) increased with the incorporation of PCLNPG into the polymer matrix, reaching maximum values of 82.30 L/m2.h and 95.14% respectively, at 0.75 wt.% loading of PCLNPG as the optimum loading. These results demonstrated that the PPSU/PCLNPG membrane is a potentially beneficial choice for wastewater treatment.

Keywords: Membranes modification, PPSU, Nanoparticles, Dye removal, Graft co-polymer.

RN1028: Preparation of high-efficiency greases using various porous solids as thickening agents for Iraqi lubricating oils

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Abstract

The rapid development in the engine industry requires greases with properties that reduce friction, resist corrosion, and have high stability against water. Accordingly, this study focuses on preparing lubricating greases (LG) with properties suitable for working under severe service conditions such as high temperature and pressure. Emphasis was placed on using local raw materials such as Iraqi Bentonite (IB) as a porous solid thickening agent with base oil that is produced in Iraqi refineries. Hence, the effect of thickener and lubricating oil on the consistency of the produced grease was studied, as well as the effect of using other additives in the grease formulation on the product properties. In this study, the percentage of thickener within the grease was kept constant in all types of the used base oils, namely Stock 60 and Stock 150, with viscosities ranging from 62.71 and 318.85, respectively, at 40°C. IB was activated and converted from hydrophilic to organophilic en route for ensuring its dispersion in the lubricating oil via pre-treating it with different types of acids such as HCl, H_2SO_4 and HNO_3. An inclusive study was carried out on the effect of acid treatment methods on the produced grease. 45 µm activated IB granules were dispersed in the base oil at a specified ratio (i.e., 70% base oil and 30% thickener) for all types of the used base oils. 1% methanol was added as a dispersant at 40°C to produce a homogeneous mixture free of air bubbles. To avoid separation between the lubricating oil and the activated IB thickener as well as to increase solidity and consistency, 10% wax was used as an additive. Various tests were conducted on LG produced locally from cheap local raw materials, and it was found that they have high industrial properties and matched the standard specifications.

RN1030: A Comparative Study of COD Removal from Petroleum Refinery Wastewater by Anodic Oxidation using SnO2 and Graphite Anodes

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Abstract

The need for clean water has become increasingly scarce because of the high consumption rate by human and industrial requirements. Accordingly, a huge amount of wastewater was discharged into the environment and their treatment is an essential cost-effective method. In this study, wastewater from a petroleum refinery was processed by electrochemical oxidation using two synthesized anodic of graphite and SnO2 film on Cu substrate. SnO2 anode was prepared from nitrate media using an electrodeposition technique. Experiments were conducted to determine the performance of each electrode at a current density of 12 mA/cm2 in the absence of NaCl addition. The SnO2 electrode showed better processing ability than the graphite electrode at the same current density in case of no addition of NaCl. The addition of NaCl resulted in increasing the activity of graphite in the treatment of wastewater but never exceeded the efficiency of SnO2. The characterization results of SnO2 using XRD and SEM indicated a high crystalline structure with efficient morphological distribution. The best removal of COD at a current density of 12 mA/cm2 and 150 min was 79% in the case of SnO2 in comparison with 72 % in the case of using graphite with the addition of NaCl. Energy consumption in the case of SnO2 was 9.93 kWh/kg COD which is very low in comparison with using graphite (49.6 k Wh/kg COD). The decay of COD was found to obey the pseudo-first-order for anodic oxidation using SnO2 or graphite electrodes.

Keywords: Anodic oxidation; Tin oxide; Graphite; Wastewater; Pseudo first order kinetics; NaCl addition.

RN1031: A Comparison Study of Removing Soluble Benzene and Toluene from Aqueous Solution via Pervaporation Process

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Abstract

The pervaporation process (PV) is one of the membrane separation methods. A developed polydimethylsiloxane (PDMS TM 4060) membrane has been used to separate soluble benzene (C 6 H 6) and soluble toluene (C 7 H 8) from an aqueous solution via PV process. To evaluate the performance of the membrane, the separation factor and permeation flux were estimated at various operating conditions, including the feed temperature (30-50°C), initial volatile organic compounds (VOCs) concentrations (100-1000ppm for benzene and 100-500ppm for toluene), and feed flow rate (1.5 -3.5 L/min). Moreover, the response surface methodology (RSM) of the design of experiments has been used in this research to show which parameter is the most effective among the studied operating conditions on the PV performance and determined to optimize the operating conditions. A quadratic model (nonlinear regression equation) was suggested to obtain mathematical expressions to predict the VOCs permeation flux and the separation factor according to the effect of the parameters' interaction. Using the RSM based on the variance analysis (ANOVA), the optimum flux and separation factor values were obtained for the PV process at different conditions. The optimal values of the permeation flux and separation factor were 288 g/m 2 ·h and 642, respectively for benzene, at the optimal conditions of temperature (39.7 °C), initial concentration of benzene (1000 ppm), and feed flow rate (3.5 L/min) and were 125 g/m 2 ·h and 1080, respectively, for the toluene at the optimal conditions of temperature (30 °C), initial concentration of toluene (500 ppm), and feed flow rate (3.5 L/min). It was found that the feed concentration was the most influential parameter, leading to a significant increase in the permeation flux and separation factor of the PDMS membrane.

RN1032: The Recycling of Municipal Plastic Wastes into an Alternative Hydrocarbon Fuel Source via Thermal and Catalytic Pyrolysis

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Abstract

This study was devoted to examine the potential of recycling municipal plastic wastes composed of high and low density of polyethylene (HDPE), (LDPE), polystyrene (PS) and polypropylene (PP) into a good quality hydrocarbon oil via pyrolysis. This process was carried out in a fixed bed reactor operated in a semi-batch operation mode, where thermal (Th.) and catalytic (Cat.) pyrolysis were separately investigated. The pyrolysis process was conducted at heating rate of 5° C/min under 5 bar pressure and a final temperature of 470 and 437 °C, respectively. Thermal pyrolysis revealed the production of hydrocarbon oil by 75.8%. However, the catalytic pyrolysis conducted by the use of a commercial zeolite-base catalyst, showed a higher tendency towards light gas 33.05 % compared to thermal process 1.96%. Yet, oil fraction was superior at 66.55% with the dominance of longer chain hydrocarbons (C 12 -C 24). A comprehensive chemical and physical characterization were performed for the analysis of oil yield in order to consider the similarity with standard hydrocarbon fuels. A higher tendency towards the gasoline oil fraction regarding carbon number was recorded by the Th. pyrolysis at 58.03% compared to cat. pyro-oil which approached the gas oil by 65.8%. On the other hand, the PIONA analysis revealed a very good paraffins and aromatics content ranging from (31.63-33.69) % and (39.42-40.47) %, respectively which approaches the standard fuel composition. The study has introduced a very promising recycling technique, side by side with an alternative energy source.

RN1033: Mixed Matrix Membranes (MMM) for Wastewater Applications

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Abstract

Mixed-matrix membranes (MMMs) have emerged as a promising approach for developing new, stable, and highly effective separation materials for gas and liquid separation. In this work, we fabricated a novel polyethersulfone (PES) ultrafiltration (UF) flat sheet mixed matrix membranes (MMMs) for water application by introducing TiO_2 NW-CuO nanoparticles, which were modified using a silanization method with tetraethoxysilane and PEG-400. This modification aimed to improve membrane performance by enhancing filtration efficiency and antifouling properties during the ultrafiltration process. The MMMs were prepared using a non-solvent-induced phase inversion method, with varying amounts of modified TiO_2 NW-CuO nanoparticles in the blend. The modified nanoparticles were characterized using Fourier transform infrared spectroscopy (FTIR), field emission scanning electron microscopy (FE-SEM), and energy-dispersive X-ray (EDX) spectroscopy, whereas the MMMs will be performed by a series of characterization tools including Fourier Transform Infrared Spectroscopy, Field Emission Scanning Electron Microscopy, Energy Dispersive X-ray Analysis spectroscopy, Contact Angle (CA) and Tensile Strength. the studies will aim to investigate the impact of the modified filler on membrane performance and its effectiveness in water purification. The findings will contribute to the development of advanced MMMs with improved properties for water separation applications.

Keywords: Mixed matrix membrane, polyethersulfone, TiO2 NW-CuO nanoparticles,

ultrafiltration process, water application.

RN1034: Preparation of Hydrophobic Membrane for Water Desalination by Membrane Distillation

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Abstract

Membrane distillation (MD) is a promising technology for recovering resources and water from brackish and seawater. However, characteristics of current membranes limit the employment of membrane distillation., Surface hydrophobicity is the highly desirable characteristic for performance in MD. In this work, poly (vinylidene fluoride) (PVDF)/polymethyl methacrylate (PMMA) was used to prepare flat sheet hydrophobic membrane and blended with carbon nanomaterials powder activated carbon (CNM/PAC). The effect of CNM/PAC on the hydrophobicity of the membrane was studied. For a better understanding of membrane distillation, the performance of vacuum membrane distillation (VMD) different feed temperatures, flow rates (0.4–0.8 L/ min), vacuum pressure were studied. The result show incorporation of CNMs/PAC increase the hydrophobicity of the membranes and the permeate flux in VMD.

RN1035: Using Internet of Things in the Oil and Gas Industry

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Abstract

It cannot be denied that the oil and gas industry is the lifeblood of the global economy, and is the main factor in powering many key sectors such as transportation, electricity, heating, and manufacturing. There are many challenges present in it, including dealing with old equipment, old systems, and dangerous environments, and to overcome these challenges, many companies working in this field have turned to digital transformation, also since innovation is the key to growth in any industry and therefore rely on Many companies in the oil and gas industry are now using advanced technologies, including the Internet of Things. These companies are now turning to using the Internet of Things, which is the leading digital technology in the digital transformation process that can be used to solve problems in the oil and gas industry.

With the Internet of Things, industry can leave behind discrete processes and embrace digitization, optimization and automation like never before. All complete IoT systems are the same in that they represent the integration of four distinct components: sensors/devices, connectivity, data processing, and user interface. As the prices of sensors and communications continue to fall, it becomes cost-effective to add more devices to the Internet of Things.

The Internet of Things creates a network of interconnected devices and sensors that collect, analyze, and exchange data in real time, and embraces digitization, optimization, and automation like never before. The Internet of Things provides an affordable way to connect and automate devices. It's not just the Internet that's cheap. You can also choose IoT apps and devices at very low prices. In addition, thanks to intuitive interfaces and smart devices, the Internet of Things is easily accessible.

This is an additional impetus for the oil and gas industry to become more innovative and deploy smart field technologies, to improve operational efficiency, risk management, lower maintenance costs, improve environmental monitoring, better decision making and advanced analytics.

The aim of this research is to provide a quick look at the possibility of addressing the problems existing in the oil and gas industry using the Internet of Things, which is one of the modern smart digital technologies in addressing the challenges existing in the oil and gas industry.

RN1037: Short-Term Load Forecasting in Refineries: A Comparative Study of Dual Machine learning Techniques

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Abstract

Oil refineries are of great importance to the world; economies and their sustainability. Continuous electricity is necessary for oil refineries to ensure the efficient operation of control and automation equipment, ensure the continuity of high-quality production of petroleum products, and reduce production interruptions, economic losses, and the damage that accompanies these interruptions to equipment and machinery. In addition to the safety risks during a sudden shutdown. Failure to accurately forecast loads can result in these shutdowns. Conversely, supplying excess energy beyond the requirement increases production costs and results in suboptimal resource utilization. Therefore, this research aims to accurately predict the loads required in the short term to avoid the occurrence of these problems by using two machine learning techniques to predict short- term loads for one of the Iraqi oil refineries as a case study, which can be generalized in the future to all refineries. The results of the predicted loads will be compared with the actual loads to measure the quality of the proposed model as well as there will be a comparison between the two techniques to determine the best performance between them.

Keywords: Refineries, short term load forecasting, STLF, machine learning.

RN1038: Evaluating the Effectiveness of Biopolymers as a Water-Alternating Gas Agent for Enhanced Oil Recovery in Heterogeneous Reservoirs

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Abstract:

Biopolymers are increasingly being used as water-alternating-gas (WAG) agents for enhanced oil recovery (EOR) in heterogeneous reservoirs. Biopolymers are natural or synthetic polymers that can be used to increase the viscosity of water, improve the sweep efficiency of waterfloods, and reduce the mobility of gas. This study evaluates the effectiveness of prepared biopolymers as WAG agents for EOR in heterogeneous reservoirs. The biopolymer was prepared by biological fermentation and purification, and evaluated in terms of their viscosity, stability to salinity and temperature in laboratory tests. Petrel software will be used to build a geological model of the heterogeneity reservoir and then Eclipse software to simulate the injection of the WAG in the formation to study their effect on the oil production rate. This can lead to significant improvements in oil recovery, especially in heterogeneous reservoirs where traditional waterfloods are often ineffective. Comparison study was conducted to compare between the biopolymer prepared and the conventional polymer like hydrolyzed polyacrylamide (HPAM) and
polyvinyl alcohol (PVA). The results of the study showed that the biopolymer evaluated had the potential to improve the sweep efficiency of waterfloods in heterogeneous reservoirs in terms of improving sweep efficiency. The study also showed that the stability of the biopolymers to salinity and temperature was an important factor to consider when selecting a biopolymer for use as a WAG agent in EOR.

Keywords: Biopolymer, WAG agent, EOR, heterogeneous reservoirs, sweep efficiency, Reservoir Simulation.

RN1039: An Integrated Geology-Reservoir-Engineering Acid Stimulation Solution Unlock the Production Potential in Low Permeability Carbonate Reservoir in Central Iraq

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Abstract

The low permeability carbonate reservoir in central Iraq was discovered in the 80's, facing the acid stimulation demand of shut-in well reactivation and new drilling well high- efficiency production. Low permeability, poor pore connectivity and non-ideal production necessitate the shift from conventional acidizing and pad fracturing to integrated geology- reservoir-engineering acid stimulation solution, such as multistage acid fracturing and pinpoint acidizing techniques, which achieve better fracture conductivity and deep penetration to maximize the production potential. Petro-physically speaking, effective porosity, net pay and hydrocarbon pore volume are related to reservoir performance. In this low permeability carbonate reservoir, previous acid stimulation analysis shows that the factors affecting production capacity are far more than those above mentioned. The injection parameters, surface etching and conductivity were lab- tested and evaluated among the four techniques of matrix acidizing, pad fracturing, alternating injection with acid and linear gel and proppant-slurry acid fracturing. An integrated geology-reservoir-engineering acid stimulation solution was first-ever proposed to unlock the production potential. Comparing to the conventional acid stimulation, this solution is a combination of theoretical research, systematical evaluation and simulation optimization. Geological research is used to analyze the geological characteristics of the target reservoir, optimize appropriate acid treatment and establish a reservoir stimulation geological model. Reservoir studies will tell us what levels of stimulation are needed to maximize economic productivity and let engineering research realize them. The studies include Logging and fitting, Physical evaluation, Simulation and optimization, In-situ stress modeling, Stimulation simulation, On-situ engineering and supporting, Evaluation after operation and Economy and NPV. At present, representative technologies that have been successfully applied include Multistage injection of acid fracturing and uniform acid displacement of acidizing in vertical wells and pinpoint injection acidizing of openhole horizontal wells. 45 acid stimulation jobs have been performed with a 100% success stimulation rate. In vertical wells, the average production up to 1500 bbl/d after acid fracturing comparing with non-flow by sole perforation, and the maximum increase ratio more than 10 times. In horizontal wells, the average production more than 2000 bbl/d after acidizing, and the maximum increase ratio is 4.95 times. Many technical and operational challenges were faced and properly handled with lab tests, numerical simulation and evaluation, which will form the completion and stimulation strategies for the low permeability carbonate reservoir.

Keywords: Acid Stimulation, Integrated Solution, Carbonate Reservoir, Low Permeability, Central Iraq

RN1040: Improvement of Heat Transfer in Gas-Solid Fluidized Bed Systems by implementing Nano Copper oxide Coatings

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Abstract

This study explores the potential advantages of applying a copper coating to glass beads of different sizes, specifically 200 and 600 micrometers. The main objective is to improve heat transfer in gas-solid fluidized bed systems. The coated beads underwent comprehensive analysis using various techniques, including BET surface area analysis, SEM imaging, and X-ray diffraction. The results confirmed the successful formation of a copper layer on the surface of the beads. The study also measured the impact of air velocity and heating power on the heat transfer coefficient before and after coating. The findings demonstrated significant enhancements in the heat transfer coefficient, particularly at higher velocities. Computational Fluid Dynamics simulations were used to model the temperature distribution within the fluidized bed, emphasizing the importance of optimization strategies for achieving uniform temperature profiles. Overall, this research showcases the effectiveness of copper coatings in improving heat transmission characteristics in fluidized bed systems, offering potential advantages in terms of efficiency and cost-effectiveness for industrial applications.

RN1042: Study Coagulation Pretreatment of back wash water by new composite poly-aluminum-ferric-sodium alginate-chloride coagulants with composite poly-aluminum-ferric-silicate-chloride coagulants for treatment

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Abstract

The aim of this work was the study pre-treatment of Spent filter backwash water, A new inorganic polymer coagulant was prepared, the first composite poly- aluminum-ferric-silicate-chloride coagulant the second composite poly-aluminum- ferric-sodium alginate-chloride coagulants then study the coagulation process, a comparison performance of two a new inorganic polymer coagulant was made between the optimum jar test values for pH, coagulant concentration using central composite design (the standard design of response surface methodology (RSM)). The optimum conditions for these factors were chosen when the final turbidity, the efficiency removal, total suspended solids (T.S.S), hardness, total Alkalinity, settling time. first composite (PAFSAC) can obtain the best effect at basicity equal to 40% when the dosage of coagulant 175 mg/l, at pH was 10 give low turbidity 0.4 NTU with removal efficiency 99.99% and fast settling time after 15 min appear 0.4NTU from final settling time 60 min and hardness 40 mg/l. Second composite (PAFSiC) can obtain the best effect at basicity equal to 40% when the dosage of coagulant 175 mg/l, at pH was 10 give low turbidity 13 NTU with removal efficiency 99.69% and fast settling time after 15 min appear 13 NTU from final for settling time 60 min and low hardness 1200 mg/l.

Keywords: Coagulation; Pretreatment; poly-aluminum-ferric-sodium alginate-chloride coagulants; poly-aluminum-ferric-silicate-chloride coagulant

RN1043: Current status and future prospects of air quality and management in petroleum refineries: A Review

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Abstract:

The air quality in petroleum refineries is one of the most critical factors in the petroleum refining processes. Several parameters in the air usually have a direct influence on human health and the environment, including poisoning gases, vapors, and particulate matter (PMs). In the present study, the air quality was evaluated in petroleum refineries sites to provide more understanding of the effect of the presence of such polluted materials on the environment and on the operator's health in the refinery. Actually, it was found that petroleum refineries produce a series of fatal compounds such as sulfur compounds hydrocarbons (gases and vapors), and PM0.1, PM2.5, and PM10. All these materials play a solid impact on human health. It was found that they used many types of air filters as personal masks or central air filtration units reducing the concentration of such polluted material dramatically. Also, the results showed that the used crude oil (API) and sulfur contents regards the main two important factors that reflect air quality. The high API crude oil with low sulfur compounds produces low polluted material in the air. Moreover, it was found that the modern refineries which used Euro-5 (eco-friendly design) produced fewer emissions with a more clean environment in comparison with old versions of the refining design.

Keywords: Air pollution; Petroleum site; Air filters; Human health; Clean environment.

RN1044: Sequential improvement in degradation of organic pollutants in wastewater by employing ozonation technology in bubble column reactor: A review

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Abstract.

The live organisms are highly influenced by the water pollution problem which extended in the last five years due to increased effluent wastewater from industrial activities. Organic matter is a very fatal compound because of its higher toxicity and pathogenic activity that affects human health and aquatic life. In this review, it was focused on studying the ozonation technology to remove organic compounds from wastewater. It was found that the reaction mechanism in the reactors is highly dependent on the formed hydroxyl radicals in the reaction mixture. Then, as the concentration of hydroxyl radicals increased in the reaction mixture, the degradation reaction of organic compounds in the reactor improved dramatically. Accordingly, the bubble column reactor was applied efficiently in the ozonation reaction to achieve high removal of organic pollutants from wastewater. It was noted that the performance of the bubble column reactor can be enhanced by using packing material or heterogeneous catalysts. Moreover, the ozone concentration, organic dose, packing material, and superficial gas velocity are highly influenced the hydrodynamics and mass transfer in the reactor. Additionally, the management of these factors can enhance the removal of pollutant materials with short contact time and low cost. Keywords: Wastewater; Bubble column reactor; Ozone gas; Enhanced mass transfer; Degradation mechanism.

RN1045: Corrosion and corrosion control of the steel in acidizing oil wells processes: An overview of organic inhibitors

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Abstract

The research topic deals with one of the important problems that the oil and gas sector suffers from, which is represented by corrosion, as the corrosion of metals annually causes large losses in production as a result of stimulating oil wells using hot HCl solutions, which causes the occurrence of corrosion phenomenon in the well bottom tools, pipes and casing. In addition, a group of organic and inorganic acids and surfactants are used in well stimulation processes. In order to reduce the violent attack of the acid solution on the N80 mild steel casing materials and pipes, during the pickling process inhibitors are added to the acid medium, and to avoid the complexity of the inhibition process in the oil and gas fields, which requires organic inhibitors within the green chemistry depending on the nature of the work field such as pipelines and equipment, recovery wells, refineries, etc. Organic acids and acidic gases such as carbon dioxide and hydrogen sulfide complicate the well inhibition problem. Corrosion problems in the oil industry must be dealt with by considering various factors. Acids used in stimulation, the nature and type of reservoir rocks, and oil well equipment, whose operating conditions include casings and tubes, and these form part of the factors affecting corrosion. Thus, it needs to study each case as it is before determining the final opinion regarding the alternative materials. No suitable material can be found to survive the attack of corrosion. The designers and operators of the oil industry must take into account many serious economic and technical problems, the most important and most dangerous of which is the phenomenon of corrosion that is characteristic of the oil industry that deals with highly volatile and sometimes toxic materials and transported by pipelines over long distances and stored in huge warehouses in addition to because it requires a complex operational process that requires high heat and pressure, so if this equipment is so worn out that it is unable to withstand these harsh conditions, then there is no doubt that explosions may occur, which may be accompanied by fires, and sometimes their effect reaches the neighboring equipment and sometimes the entire production unit.

RN1046: Well Log Analysis and Interpretation for Mishrif Formation for Amarah Oil Field

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Abstract

This study intends to interpretation of well logs for the purpose of determining petrophysical parameters for Mishrif formation in Amarah Oil Field. This field is located in the province of Maysan ten kilometers to the southwest of Amarah and ten kilometers to the northwest of Halafaya's field, and is located southeast of the field of Kamit and about 30 km. M-N cross plot as well as the Matrix Identification (MID) have been applied to calculate mineralogy and lithology of the formation. The result showed that the formation included mainly of calcite with some dolomite. Density – Neutron cross plot for lithology identification shows that formation mainly limestone with a little shale. Archie's parameters have been determined by the use of pickett's plot and found the range values of Archie's parameters a, m and n are found to be (1), (1.29) and (2) respectively

Keywords: Amarah field, Well Log, Mishrif formation, petrophysical parameters, cross plot.

RN1047: Acidic Influence on Geopolymerization: A Thorough Study Using HCl and Iraqi Kaolin

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Abstract

Recent advancements have sparked considerable interest in the development of novel catalysts that are not only effective but also cost-efficient and environmentally friendly. Geopolymers, which exhibit an amorphous structure comprising three-dimensional networks of SiO4 and AlO4 tetrahedra with a negative charge balanced by extra-framework cations, have emerged as promising candidates for industrial catalyst applications. These geopolymers possess diverse chemical compositions, ion exchange properties, and cationic sites, resembling zeolitic materials. This study focuses on the synthesis of geopolymer catalysts using Iraqi kaolin in two variations, namely white and red kaolin. Six distinct mixtures were prepared to investigate the impact of kaolin type on the geopolymer properties. Additionally, hydrochloric acid (2M) leaching was conducted on the geopolymer base kaolin to examine the effect on the specific surface area of the prepared geopolymer foams. The increase in surface area is a critical factor in enhancing adsorption capacity, thereby rendering the material more suitable for catalyst applications. The characterization of the geopolymer base kaolin involved techniques such as X-ray diffraction, X-ray fluorescence, Fourier-transform infrared spectroscopy (FTIR), and BET (Brunauer-Emmett-Teller) analysis. X-ray diffraction confirmed the formation of amorphous reaction products, with observable shifts in the amorphous halo, indicative of the raw materials' transformation. Moreover, FTIR analysis revealed distinctive shifts in characteristic bands of aluminosilicates, corroborating the geopolymerization process and clearly appearing Brønsted (1545 cm^{-1}) and Lewis's acid centers (~1450 cm-1). Overall, the primary objective of this study is to produce geopolymers with desirable properties for effective catalyst applications in various industrial processes. The potential of these geopolymers to act as catalysts opens up new opportunities for creating sustainable and efficient chemical reactions, paving the way for a greener and more environmentally conscious future.

Keywords: Kaolin, Geopolymer, Catalyst.

RN1048: Synthesis and electrochemical behavior of a novel anticorrosion nanomaterial coating carbon fiber (CF)

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Abstract

Corrosion constitutes a significant obstacle for the electrodes of energy storage, leading to a reduction in their capacity, cyclability, and shelf life. Additional focus should be placed on the phenomenon of electrode corrosion during the development of rechargeable energy storage devices with high energy density. The current study looked into whether mixed transition metal oxides (iron cobalt oxide) could be used as coatings for electrode materials for supercapacitors in order to improve the electrochemical properties of carbon fiber cloth (CFC). Cobalt-based binary metal oxides, such as Fe-Co-O oxides, have gained significant popularity as electrode materials for supercapacitors. Fe-Co-O can be attributed to their cost-effectiveness, abundant natural availability, and environmentally friendly nature. Iron cobalt oxide ($FeCo_2O_4$) is a suitable coating material on carbon fiber cloth (CFC) to prevent corrosion, improve performance, and result in durability over the lifetime of these electrodes. In this work, we fabricated a spinel structure of $FeCo_2O_4$ film on CFC substrate using the solid-state method. The electrochemical corrosion performances of two samples, CFC and $FeCo_2O_4$-CFC in a 3.5 wt% NaCl solution were focused. Results revealed that $FeCo_2O_4$-CFC film exhibited superior corrosion resistance than CFC because the high content of Co acts as a barrier against the oxidation of iron and increases passive behavior. However, different nanostructures of $FeCo_2O_4$ spread and covered CFC to obtain superior corrosion resistance. For $FeCo_2O_4$-CFC, the E_{corr} and i_{corr} increase in a positive direction, decrease the corrosion rate ($3.283*10^{-7}$ µmpy), and achieve high coating efficiency (97%), which could be attributed to the good effectiveness of $FeCo_2O_4$-CFC.

Keywords: Carbon fiber cloth, corrosion resistance, $FeCo_2O_4$, energy storage electrode, electrochemical variables

RN1049: Analytical Prediction of Gas Hydrate Formation Conditions for Oil and Gas Pipeline

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Abstract

Oil and gas production operations such as the subsea production system typically exposed to rough underwater environments such as low temperatures and high pressure as most of the subsea facilities are placed on the seabed. The rough environment conditions will result in the formation of gas hydrates often when there isa presence of moist in the production fluid as well. Ice-crystalline structure of hydrates will be dissipated in the inner wall of pipeline network or tubing and lead to flow assurance issues such as blockage in the oil and gas production operations. In this paper, the underwater wireless sensor network (UWSN) is proposed to demonstrate the feasibility of real-time monitoring of pipeline health condition in overcoming hydrate-associated issues in oil and gas pipelines. Next, an analytical prediction model of gas hydrate formation in oil and gas pipeline also is developed through the application of Aspen HYSYS simulation and Feed-Forward Artificial Neural Network (ANN) modelling. The development of the prediction model and the feasibility of the UWSN in oil and gas production field will assist operators in decision making for the intervention process of oil and gas pipelines specifically in gas hydrates-associated problems.

Keywords: Hydrate formation, Underwater wireless sensor network, Artificial Neural Network, Flow Assurance, Pipeline.

RN1050: Characterization and Separation Performance of Polyethersulfone Membrane Blended with green additive for enhanced the methylene Blue (MB) Dye Removal

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Abstract

To overcome the issue of low flux in ultrafiltration (UF), an appropriate additive is incorporated into the base polymer to alter the membrane& morphology, thereby improving flux rates. In this research, the potential of chamomile leaf nanoparticles (Chm NPs) as a novel environmentally friendly material for use in UF membrane synthesis was explored. To better understand the impact of Chm on the production of PES UF membranes, a range of membranes were created by introducing varying amounts of Chm into the casting solution .The produced membranes were thoroughly evaluated, focusing on aspects such as porosity, pore size, hydrophilicity, membrane morphology, and UF performance. Manufactured PES/Chm membranes demonstrated significantly increased permeate water flux (PWF) (up to 367 L/m^2 h), which was three times that of the pristine PES membrane (126 L/m^2 h). Beside Methylene Blue dye (MB) rejection, it was obtained a high removal percent of about 94 %. Additionally, decreased contact angle (C.A.) for modified membranes (47%), compared with pristine PES membranes, all these results led to enhance the membrane permeate flux and rejection. The utilization of chamomile as a novel environmentally friendly addition holds significant potential in the production of UF membranes for wastewater treatment.

RN1051: An Experimental Assessment of Using Different Sizes of Immersed Heating Surfaces on Heat Transfer Coefficient in Gas-Solid Fluidized Bed Reactor

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Abstract

The ever-expanding variety of applications for fluidized beds has been accompanied by vigorous efforts to develop the mechanism and analysis of the heat transfer process in gas-solid fluidized beds. The high rate of heat transfer in a gas-solid fluidized bed is most likely the fluidization processs most significant advantage. Experiments were carried out in gas-solid fluidized bed to investigate the steady state heat transfer between gas and solid and the surface immersed in the bed. The bed column was 172 mm in diameter and 1000 mm in height fitted with a horizontal heating tube of different diameters (i.e. 19.5, 25.4 and 30 mm) The fluidizing medium was air at different velocities, from fixed bed to the fluidized bed condition (0.024-0.387 m/s). Three different sizes of sand particle were employed (i.e. 200, 300 and 400 µm) monitoring these measurements by computer on line. Heat transfer coefficients are found to increase with fluidizing air velocity and, they show an inverse dependence on particle size. The effect of heating tube diameter on heat transfer coefficient has been investigated showing an interesting variation revealing the hydrodynamic conditions of the bed.

Keywords: Gas-Solid Fluidized Bed, Heat Transfer, Heat Transfer Coefficient, Particle Size Distribution

RN1052: Corrosion Behavior of Carbon Steel Electroplated with Nickel-Copper Layers Used in Petroleum Applications

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Abstract

Low carbon steel is widely used in oil and gas applications. In this research multilayers of Nickel (Ni) and Copper (Cu) have been deposited on low carbon steel substrate using the electroplating process (ELP).The first layer of Ni is coated to be followed by a layer of Cu . ELP was implemented using Watts bath containing (300 g/l) of $NiSO_4$. $6H_2O$, (30 g/l) of ($NiCl_2$.$6H_2O$), (40 g/l) of H_3BO_3 and (30g/l) of (NaCN),(30g/l) of (CuCN) ,(10 g/l) of (NaOH $6H_2O$). First bath parameters were temperature is (59 - 60 °C), current density in the range of (3-5 Amp/dcm^2), voltage was holed at (8V), for Ni, and temperature was between (50-51°C), current density in the range of (1-2 Amp/dcm^2), voltage was holed at (4 V), while the plating time (10 minutes) for both Ni and Cu. The results refer to Ni, Cu, and Ni & Cu ELP thicknesses 3, 4.77 and 6.75µm respectively. Metallurgical tests were achieve including the micro hardness of ELP, Vickers micro hardness results showed improvement in hardness values compared, with steel substrate, and in the presence of Ni, Cu, Ni &Cu layers ,322, 581, 479, and 562 Hv respectively. The roughness was measured using surface roughness measurement device .The average surface roughness (Ra) depicted a satisfying values as a result of Ni layer coating, which gave uniform surface distribution with Ra 0.363 µm. X-ray diffraction pattern (XRD) test examinations are adopted as a good evidence for the presence of Ni, and Cu in both internal and external finish layers, respectively. Corrosion examinations were carried out in seawater solution (3.5 NaCl gm) the corrosion behavior tends to be more resistance, with layers of Ni, and Cu in sea water environment, which is considered an important criterion to increase the part life.

RN1053: Fabrication, characterization of a novel (PLA/PBAT/green nanoparticles) ultrafiltration membrane for oily wastewater treatment

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Abstract : Ultrafiltration membrane is often considered a greater efficient technique for purifying oily-wastewater. The main goal of the research was to enhance performance and antifouling features of PLA/PBAT membranes for oily wastewater treatment by incorporated banana peels (BP) nanoparticles. A field emission scanning electron microscope (FESEM), contact angle, pure water flux, porosity, tensile analysis and FTIR analysis were used to characterize the prepared membranes. Outcomes of the FT-IR test showed that BP nano-particles were effectively anchored to the PLA/PBAT membrane matrix. The contact angle decreased from 73.7° for the pristine PLA/PBAT membrane to 38.99° for the (0.05 wt. %) BP-NPs incorporating membrane, indicating that the presence of nanoparticles enhanced the hydrophilic properties of the membranes. the addition of nanoparticles increased the hydrophilicity of the membranes. The similar pattern was seen for the flux of pure water of PLA/PBAT/BP membranes, suggesting that membranes with a concentration of 0.05 weight percent of BP NPs had the maximum pure water flux due to the synergistic nature of the nano particle, the addition of BP-NPs boosted the mechanical properties of the membranes. Lastly, an ultrafiltration system that utilizes oily wastewater as feed was used to evaluate the prepared membranes. The findings demonstrated that compared to neat PLA/PBAT membranes, PLA/PBAT/BP membranes exhibited a lower flux decrease and a greater oil removal efficiency of (105.3 L/m2h) and 95.2%, respectively.

Keywords: Oily wastewater, polymeric membrane, oily wastewater, banana peels, phase inversion.

RN1054: Impact of Industrial Heat Exchanger on Flow Regime Identification in Bubble and Slurry Bubble Columns for Fischer Tropsch Application

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Abstract: To improve the design of bubble column reactors BCRs and to scale up processes, it is necessary to characterize the hydrodynamics by means of flow regime behavior. The primary objective of this work is to investigate the impact of internal structures on a variety of hydrodynamic characteristics of air- water and air-water-glass beads systems, such as pressure drop; gas holdup; and regime transition velocities. A simulated of Fischer-Tropsch bubble column is constructed. The experimental investigations were conducted in a 1.8 m-height Plexiglas BCR with an interior diameter of 0.14 m. The selected system integrates the U tube's bottom end and comply with the requirements of the TMSA in relation to shell and tube heat exchangers. 18 vertical copper tubes with an outer diameter of 14 mm of novel design of heat exchanger tubes were used. In order to enhance the measurement and comprehension of the hydrodynamics within the reactor, this study employs a new method to precisely determine how vertical tubes affect pressure drop and overall gas holdup. The superficial gas velocities that were employed ranged from 0.03 to 0.27 m/s. According to the initial findings, the regime transition velocities; which represent the flow conditions at which the column transitions between several operational regimes; “such as., bubbly flow; transition and churn-turbulent” have been successfully identified. Additionally, experimental data indicated distinct transition velocities in the BC and SBC with the modified the design of internals, and significant increase in pressure drop and gas holdup, which a crucial characteristic that determines the overall efficiency of gas-liquid interacting in both BC and SBC. The findings of the trial showed that the new vertical internals design (industrial heat exchanger tubes) had a favorable effect, which significantly enhanced mass transfer and the performance of the system and raised the bubble column's efficiency.

Keywords: Fischer tropsch process; bubble/slurry bubble column reactors; industrial heat exchanging tubes; flow regime

RN1055: Utilizing Covalent Triazine Framework (CT-1) Loading for CT-1/Polysulfone Mixed Matrix Membrane for CO2 Capture

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Abstract: The growing need for carbon dioxide (CO_2) removal in various industrial sectors has led researchers to focus on the positive features of mixed matrix membranes (MMMs). Covalent triazine frameworks (CT-1) and polysulfone (PSF) were both used in the creation of MMMs. Due to the high porosity, significant area of surface, uniform dimension of pores, and thermal and chemical resistance, CT-1 was selected. The newly developed CT-1/PSFMMMs were prepared with different CT-1 loadings (0, 0.1, 0.3, 0.8, 1.1, and 1.5 wt%) in dope solution. The performance of membranes was evaluated using FTIR, FESEM, TGA, mechanical properties, and gas separation tests. In pure gas tests, the CO_2 permeance and ideal CO_2/N_2 and CO_2/CH_4 selectivity increased when CT-1 loading was increased from 0 to 0.8 wt%. MMMs confirmed 109.12% and 91.42% increases in CO_2/N_2 and CO_2/CH_4 selectivities compared to pure PSF, respectively. However, a further increase in CT-1 loading beyond 0.8 wt% led to a drop in ideal selectivity. CO_2 permeance and selectivity were reduced with pressure (2, 3, 4, and 5 bar). Additionally, investigated the effect of the feed stream (3/97 vol%) in the CO_2/CH_4 gas mixture on CO_2 separation. This paper describes a new technique for improving the ability of mixed matrix membranes through CT-1 fillers.

Keywords: Polysulfone (PSF), Covalent triazine framework (CT-1), MMMs, filler loading.

RN1056: Investigating the Effect of Adding Linear Alkyl Benzene Sulfonate (Labs) on The Extraction Aromatics from Base Oil by Using Furfural Solvent

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Abstract

To raise the general quality of the lubricating oils that are generated, aromatic hydrocarbons from lube-oil cuts must be removed. The most common method for removing aromatic components from a lube-oil cut is liquid-liquid extraction. Because furfural has a high selectivity toward aromatic molecules, it is the solvent that is most frequently utilized in this process. Other solvents were used as N-methyl, 2, pyrrolidone (NMP), phenol and sulfur dioxide, etc.

In this investigation, the furfural is used as a solvent extraction for the reduction of distillate lube oil fraction aromatic content. In addition, linear alkyl benzene sulfonate was used as a surfactant to increase the extractive power and the selectivity parameters, it improves phase separation and raises the yield of the refinery as a result. The surfactant concentrations and operatory extraction temperatures ranged from 0.01 to 0.1%wt and 300 to 350 K, respectively. Temperatures and surfactant concentrations were measured in a methodical manner to establish ideal extraction conditions. The concentrations of aromatic, paraffinic, and naphthenic components were compared to the molecular weight, sulfur content, viscosity, and refractive index (RI) of ASTM standards. The experimental findings indicate that 350 K and 0.01%wt of surfactant produced the greatest outcomes.

RN1058: BiOBr Synthesis, characterization and photo-catalytic degradation under visible light irradiation: A comprehensive review

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Abstract

Semiconductor based photo-catalysts which was an effective technique for treating and removing pollutants from water and wastewater. According to suitable band structure, bismuth bromide oxide is a promising candidate to treat wastewater efficiently by photo-catalysis. There are various techniques can be used for enhancement of photo-catalytic properties such as element rich strategy, doping, defect control and facet engineering. This review primarily focuses on the commonly methods for manufacturing of BiOBr, the BiOBr photo-catalytic activity for treatment water and wastewater, the roles of operational parameters on the photo-degradation efficiency of pollutants and strategies that are employed for improving the BiOBr photo-catalytic activity.

RN1059: The effect of annealing temperature on the prepared nano structure CuO using sol-gel method

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Abstract

CuO nanoparticles Synthesis by low cost sol- gel route method using ethanol as solvent conceder. The effects of two annealing temperatures (500 and 700 °C) on the structural of the CuO nanoparticles Synthesis have been studied. CuO Nano particles are prepared by novel sol gel technique. $Cu(NO_3)H_2O$ is added to ethanol with continuous stirring. Then it was dried in air for one day to form gel. The CuO Nano particles were characterized for the studying of their structure and composition using X- ray diffraction and size with Particle Size Analyzer. For the morphology test SEM carried out.

RN1060: Synthesis of Nano-silica Particles using Eucalyptus globulus Leaf Extract and Their Innovative Application as an Adsorbent for Malachite Green Dye

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Abstract

The present study focuses on the synthesis of silicon dioxide nanoparticles (SiO_2) using a green method, incorporating *Eucalyptus globulus* leaves extract and potassium metasilicate (K_2SiO_3) as the precursor. A comprehensive characterization of the prepared nanoparticles was performed using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), Brunauer-Emmett-Teller (BET) analysis, and dynamic light scattering (DLS). The results confirmed the purity of the SiO_2 nanoparticles and exhibited a range of diverse functional groups on their surface. Furthermore, the average size and surface area of the nanoparticles were determined to be 127 nm and 218 $m^2.g^{-1}$, respectively. These well-characterized SiO_2 nanoparticles were employed as an effective adsorbent for the removal of malachite green dye from aqueous solutions in a batch mode adsorption unit, under varying operating conditions. The factors considered for evaluating the efficiency of SiO_2 nanoparticles as an adsorption media included pH, contact time, agitation speed, dye concentration, temperature, and the quantity of nanomaterial utilized. Experimental results demonstrated a remarkable removal efficiency of 96% for malachite green dye at an initial concentration of 100 ppm in the contaminated solution. Interestingly, the percentage removal exhibited an inverse relationship with dye concentration and temperature, while being directly proportional to other factors. Overall, the green-synthesized silicon dioxide nanoparticles proved to be a promising adsorbent for the effective removal of malachite green dye from aqueous environments. The results highlight the potential application of these nanoparticles in wastewater treatment and pollution mitigation, offering a sustainable and eco-friendly solution for environmental challenges.

Keywords: Silicon dioxide nanoparticles, green method, malachite green dye, Eucalyptus globulus leaves, extract

RN1063: Experimental Study and Modeling of the Synergetic Impact of Adsorption-Photocatalysis Process on the removal of toxins in a Continuous Wastewater Flow System

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Abstract

The demand for effective treatment methods for wastewater has increased as a result of the alarming incidence of hazardous organic contaminants. The aim of this study is to offer a comprehensive analysis of the photocatalytic and adsorption processes, as well as their prospective applications in the removal of harmful contaminants from wastewater. Surface adsorption has gained popularity as a wastewater treatment technology due to its simplicity, cost-effectiveness, capacity to function in mild conditions, ease of expansion, and low toxicity. Combining surface adsorption with photocatalytic reactions might be a feasible approach to create a treatment procedure for petroleum refinery wastewater (PRW) that is both effective and ecologically friendly. Photocatalytic water treatment has lately garnered significant attention. Photocatalysis is an advanced and innovative alternative technology. It possesses several benefits, such as operating under standard temperatures and atmospheric pressure, affordable costs, absence of secondary waste generation, and convenient availability and accessibility. The shape of a photocatalyst is dictated by the synthesis technique, chemical composition, and technical properties.

RN1064: Contribution of distributed temperature sensing (DTS) for fire and leak detection processing in the petroleum pipelines using fiber optics: A review

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Abstract

The detection of petroleum pipeline leaks is regarded as an important challenge in the middle petroleum industry. The loss of crude oil or petroleum fractions due to leaks or accidents caused by fatal and expensive economic wastage. Then, the use of a high detection and rapid response system will reduce the expected losses and solve the leak problem in pipelines in a shorter time. In the present review, distributed temperature sensing (DTS) for fire and leak detection was explained to enhance the ability to treat any operating problem or accidents that can appear along transportation pipelines. It was found that the DTS system can serve efficiently to detect fire or freezing problems in petroleum pipelines. The quality of fiber optics and the type of applied laser source reflects the high performance of the leak detection process. The response or any accidents in pipelines can be solved within 1-3 min by closing or bypassing the flow in the piping system. The high-power CO_2 laser of more than 150 W and 10 µm wavelength is more favorable to long-distance transportation pipelines in the range from 100-1800 km. The results indicated that the Raman scattering approach and mechanism in the operating system is the dominant factor in determining the efficiency of leak or fire problems in pipelines. In this system, it was found that the fiber optics operated as temperature sensors having the abilty to measure the temperature at each 1 m from transportation pipeline distance. Additionally, the application of DTS in the petroleum industry will improve the quality of petroleum pipeline detection and control as well as the simple and low operating costs.

Keywords: Leak detection; Fiber optics; Safety system; Raman scattering; Laser technology, Graded-Index Fiber (GI).

RN1066: Influence of Heat Exchanging Tubes on Local Heat Transfer Coefficient in Fluidized Bed Reactor

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Abstract:

Fluidized bed reactors are widely used in a variety of chemical industrial processes for extremely exothermic reactions. But the performance of the reactor could be impacted if the exothermic reaction's heat isn't removed sufficiently. Understanding and analyzing the heat transfer mechanisms occurring in the reactor is crucial to improving the reactor's overall performance as well as the chemical process. The investigation was carried out in two stages) one tube heater , five internals equipped with one tube heater) . In both stages, the heat transfer probe was moved to different places around and inside the center. A sophisticated heat transfer system was used to investigate locally and instantly how a bundle of vertical heat-exchanging tubes affects the heat transfer coefficient (HTC) in a gas solid fluidized bed. The experiments were conducted on 0.13m inner diameter Plexiglas fluidized bed reactor by using silica sand as particles with size of 600µm. The local heat transfer coefficient (LHTC) increase with increasing fluidizing velocity. There is a different behavior of HTC at various local position of tube heater in comparison with other different tubes position. When there are vertical internals present in the center, the HTC increases by 31% for different gas velocities. A comparison of local heat transfer coefficient with internal tube and without internal tube gives a reasonable result.

Keywords: Multiphase flow system, immersed internals, Heat transfer performance, fluidized bed reactor, Silica sand.

RN1068: Experimental and Numerical Investigations of Convective Heat Transfer Intensification by using Nanofluids: A Review.

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Abstract:

The experimental and numerical optimization of convective heat transfer using hybrid nano fluids and nanofluids with prospective applications reviewed in this paper. Also includes a comparison of the use of different types of nanoparticles and base fluids, methods for preparing nanofluids and hybrid nanofluids, their physical properties, and the effect of these properties on improving heat transfer. Nanofluid properties have a substantial impact on heat transport optimization. Because the literature in this field is disperse across a wide range of disciplines, including heat transfer, physics, material science, synthetic chemistry, and chemical engineering this paper provides an updated review of the heat transfer applications of nanofluids to develop directions for future work. It also found that the hybrid use of nanoparticles is more efficient than the use of nanoparticles alone within the same containment volume.

Keywords: Nanofluid, hybrid nanofluids, convective heat transfer, and heat transfer enhancement.

RN1069: An Update Review of utilizing Nanofluids as Automotive Radiator Coolants: A Promising Approach for Enhanced Heat Transfer

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Abstract:

The automotive industry is always looking for new and creative ways to boost a car's performance and efficiency. In order to maintain optimal engine performance and avoid overheating, which can result in mechanical problems and decreased fuel efficiency, efficient heat dissipation is essential. Because of their improved heat transmission capabilities, nanofluids suspension fluids with nanoscale particles have become a viable substitute for conventional coolants in car radiators .This paper examines practically all of the studies that have been conducted in this field that are available in the literature. The author collects information on nanoparticle materials and sizes, as well as the volume, base fluid, concentration, Nusselt number (Nu), and Reynolds number (Re) employed in investigations. Generally, higher nanoparticle concentration results in a more pronounced enhancement in heat transfer and an increased need for pumping power. Utilizing nanofluids results in a decrease in the energy consumption related with pumping, due to the enhanced heat conduction capability of nanofluids.

RN1070: Bio diesel production from macroalgae: A review

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Abstract

Bio diesel production from macroalgae using base catalysts is a topic of growing interest in the field of renewable energy. In this review, we explore the various methods and strategies employed for the synthesis of bio-diesel using macroalgae, with a focus on the use of base catalysts. The review begins by providing an overview of bio-diesel production and its significance as a sustainable Substitute for fossil fuels. It then delves into the unique properties of macroalgae and their capacity as a primary ingredient for the manufacturing of bio-diesel. The review also discusses the advantages and challenges associated with using macroalgae, including its abundance, rapid growth rate, and low competition with food crops, as well as the issues of extraction efficiency and high production costs. The main focus of the review is Regarding The use of alkaline catalysts in the production of bio diesel using macroalgae. Solid-base catalysts have emerged as an exceptionally efficient catalyst for the manufacture of bio diesel, offering several advantages over conventional liquid-base catalysts, such as improved process efficiency, facile catalyst recovery, reduced waste generation, and minimized environmental impact.

Overall, this Offers an extensive examination of the process of producing bio diesel from macroalgae with base catalysts. This study emphasizes the capacity of macroalgae as a renewable resource and offers valuable information on the methods to enhance efficiency and address environmental concerns for the effective use of this technology.

RN1071: A review of corrosion Inhibition of Carbon Steel using Fruit, Vegetable and Rice Peel Extract

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Abstract

The global impact of metal corrosion is significant, as it poses both economic and environmental repercussions. The term refers to the process by which metals undergo surface degradation due to an electrochemical reaction with the surrounding intrusive environment, leading to its initiation and acceleration. Corrosion inhibitors are widely recognized as the most effective and cost-efficient method for preventing corrosion. The utilization of conventional and harmful corrosion inhibitors has led to environmental concerns, prompting the creation of eco-friendly, readily available, biodegradable, and economically efficient green substitutes. This review examines the utilization of green corrosion inhibitors sourced exclusively from renewable origins, focusing specifically on recent progress in employing extracts from fruits, vegetables, and rice peels as green corrosion inhibitors. Fruits and vegetables, specifically, contain abundant phytochemicals with corrosion-inhibiting properties. The experimental methodologies employed in corrosion inhibition, along with the underlying mechanism of corrosion inhibition, are extensively examined to elucidate the actual capabilities of these extracts in safeguarding steel in acidic surroundings. The study emphasizes the capacity of fruit and vegetable extracts to serve as environmentally friendly and economical substances that can prevent corrosion, thus contributing to the advancement of green chemistry. This review provides an overview and analysis of the existing knowledge and potential applications of fruit, vegetable, and rice extracts as corrosion inhibitors. It also addresses the difficulties and obstacles that arise when utilizing these extracts.

Keywords: corrosion, fruits, inhibitors, vegetable, acidic medium

RN1072: General review of developments in microbial fuel cells, their form, substrates, design, and methods of transporting electrons and protons

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Abstract:

Microbial fuel cells provide an innovative approach for both water purification and production of electrical energy. This paper examines the basic idea of a microbial fuel cell, variables that affect the functioning of the cell, and the transmission of electrons mechanics and protons. The inside of the cell and the composition of the materials used to make its major components. It also investigates the many kinds of membranes, additional substrates

Keywords: Microbial fuel cells, electrons, membrane, substrate

RN1074: Simulate and Optimize the Crude Oil Distillation Unit by Applying Aspen HYSYS

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Abstract

The ASPEN HYSYS V11 software was used to compare the simulated results and plant data of the distillation unit. The data from Basra refinery company/Iraq Mishriff Light crude oils was used to study the parameters affecting CDU efficiency, like the temperature, pressure, and rate of flow, and then optimize these variables to obtain the efficient side products. This study examines crude oil from feed crude, including naphtha, kerosene, light gas oil (LGO), heavy gas oil (HGO), and Atm residue, based on boiling point temperature. The study reveals variations in real and simulated data, particularly in flow rates and temperature, influenced by accuracy and optimized methods for distillation unit data.

RN1075: MXene-Based Membranes for wastewater treatment

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Abstract

MXene are new family of two-dimensional (2D) multifunctional nanomaterials that was discovered in 2011. It has shown promise in wastewater treatment technologies due to their unique properties, such as two-dimensional multilayered structures, high mechanical strength, excellent electrical conductivity, and tunable surface chemistry. Furthermore, it can be incorporated into many polymeric materials that make it promising candidates for enhancing the performance of membranes in wastewater treatment. This article reviews the most recent advances made in the area of waste water treatment by MXene-based membranes. First, the preparation methods of MXene nanoparticles (NPs) and the fabrication technologies for MXene-based membranes are categorized. Then, different formats of MXene-based membranes in the literature are introduced due to the difference in the polymers, solvent and the additives. Next, the major MXene-based membranes are evaluated based on its effectiveness in wastewater treatment covering different types of Pollutants. Finally, this review closes with several recommendation and new directions in this research area.

RN1076: Optimization of Syngas Production from Catalytic Decomposition of Biogas over Al_2O_3 Supported Nickel based a Lobe Coral Sponge Catalysts using Central Composite Design

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Abstract

In the current research, the optimization of catalytic decomposition of biogas reaction to maximize CH_4 and CO_2 conversion as well as syngas ratio has been investigated. To improve the catalytic efficiency of the metal catalysts, our own metal support was prepared, rather than using the commercial ones. Based on this point, the use of Al_2O_3 supported nickel based bimetallic catalysts was explored for catalytic decomposition of biogas to produce syngas. The effect of operating conditions such as temperature (600-700 ºC), flow rate (100-200 mL min -1) and catalyst loading (0.8- 2g) on the catalyst activity and stability. The production of syngas was optimized via response surface methodology using central composite design model.

Keywords: biogas; catalytic; decomposition; Central Composite Design; lobe coral sponge; syngas.

RN1077: Fouling and Corrosion Control of Steam Boiler Tube Using PLC system

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Abstract

Programmable Logic Controllers (PLC) is a microcontroller system suitable for many industrial processes. The aim of the present work is to improve the performance and energy efficiency of steam boiler through adjusting the pH value and total dissolved solids (TDS) in boiler water by designing and implementing a PLC system. This system contributes to protect the boiler tubes from fouling and under deposit corrosion, in addition to reduce and control the blow down water and energy saving. The experimental result showed that the suggested controller is able to control the amount of TDS through adjusting the conductivity value as (3900 µs/cm) with total TDS values as (20 ppm). Fouling control is achieved by maintaining the PH within the requirements of the global operation framework of steam boiler as (10.3-10.5). Also, the automatic blow-down saves about 9.532% involved achieving an annual saving in fuel cost of 1230720 $/year.

Keywords: Corrosion, Electrical conductivity, PLC, Sedimentations, Total Dissolved Solid.

RN1079: Advanced Materials Calculations for Methane Dissociation over Ni (111) Surface Using Density Functional Theory

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Abstract

Advanced materials calculations have been recently widely employed. Density Functional Theory (DFT) is one of these calculations and is a powerful tool. In this work, methane dissociation over nickel surface with crystal orientation of (111) has been studied using (DFT). The barrier energy and the reaction rate constant were estimated. The dissociation rate constant on the surface of Ni (111) was 4.801x10 -15 (1/s), and the activation energies were 0.10664191E+03 eV, -0.10382003E+03 eV, and -0.10616790E+03 eV for initial state, transition state, and final state respectively.

Keywords: Advanced Materials, Density Functional Theory, Surface dissociation.

RN1081: Electromagnetic Heating for the Separation of Water Oil Emulsion

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Abstract

Water in oil emulsion is considered as a serious problem in petroleum sector, it impacts both production costs and environmental restrictions in addition to corrosion problems. The most common techniques for water – oil separation is using of an electric field with inorganic salts in a demulsification process. In the present work, a new green technique depends on electromagnetic waves of microwave irradiation was accomplished to achieve the separation without using any chemicals. The experimental part utilized a microwave reactor with 40 vol. % of water in oil emulsion concentration was tested, two operating variables were examined as: power emitted (200-1000 W), and treatment time (40-200 sec). The experiments were designed according to central composite rotatable design method with two variables, A Statistical software was utilized to achieve the optimization process to obtain the optimum conditions. The results showed that the optimum separation was produced at 800-900W power and 150-210 sec of treatment time. It was proved that microwave technique is considered as cost effective and environmental friendly technique.

Keyword: Emulsions, Microwave reactor, Water, Electromagnetic waves, oil, Separation

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RN1082: Phenol mineralization from wastewater in petroleum refineries by managing flow characteristics and nanocatalyst in ozonized bubble column

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Abstract

Packed bubble column reactor (PBCR) is an efficient category of multiphase reactors in the petroleum and petrochemical industries. The hydrodynamics parameters in this reactor regard the main imaginary mirror that reflects the operating performance. In the present study, the removal of phenol was achieved from wastewater using a packed bubble column reactor using TiO 2 as nanocatalyst. The reactor was constructed from QF-glass of 150 cm in height and 8 cm in diameter. The phenol degradation process was carried out in the presence of ozone as a gas phase in the chemical reaction. The superficial gas velocity in the reactor was studied at different gas velocities of were (i.e., 0.7, 1.3, 2, 2.7, and 3.4 cm/s). The results showed that superficial gas velocity plays an important task in determining the bubble size, bubble rise velocity, and reactor flow patterns. All these parameters provided clear indications for the high- performance reactor and then the high reaction rate of phenol degradation. Moreover, the results showed that the highest phenol removal of 100% was obtained with TiO_2 NPs as a heterogeneous catalyst in the ozonation process. Also, it was found that the use of packing material in the bubble column reactor enhances the contact total surface area inside the reactor and enhances the mass transfer operation. All these parameters will provide an efficient phenol degradation mechanism in the reactor. Finally, the use of packed bubble columns in the present experimental work improves wastewater treatment with simple operation, low cost, and high performance.

Keywords: Catalytic reaction; Hydrodynamics variables; Wastewater treatment; Phenol removal; Ozonation technology.

RN1084: Mitigating Liquid Carry-Over and Foaming in a Gas Processing Plant through the Installation of Vertical Scrubbers

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Abstract

Gas-liquid separators often encounter the challenge of liquid carry-over, where small liquid droplets become entrained in the produced gas stream. This phenomenon can lead to foaming and reduced capacity in downstream absorption processes, as observed in Iraq's Khor Mor gas-condensate processing plant. To assess whether liquid carry-over contributes to the foaming issue in the sweetening tower, this study analyzed the size distribution of liquid droplets in the gas product and the gas/liquid separation efficiency of the upstream Alpha, Bravo #1, Bravo #2, and Charlee separators feeding the tower. The analysis was conducted using the using industry-standard process software, Horizontal Vessel and Pro Separator correlations within Aspen HYSYS v.14. The study revealed that Alpha, Bravo #1, and Bravo #2 separators were unable to eliminate all liquid droplets within the specified size, failing to achieve the required efficiency. In response, the study proposes a vertical scrubber design with a standard mesh mist extractor, applying the Arnold-Stewart semi-empirical procedure. The design demonstrated a gas/liquid separation efficiency of 99% under current and future conditions. These findings suggest that the proposed design can serve as an optimal solution to control liquid carry-over, maintain high gas/liquid separation efficiency, and prevent foaming, even with an increase in the vessel inlet flow rate over time.

Keywords: Liquid carry-over · Liquid droplet size distribution · Phase separation efficiency · Vertical scrubber

RN1085: Features of the fischer-tropsch synthesis on iron-containing nanoscale catalysts based on chitosan

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Abstract

The catalytic activity of an iron–containing nanoscale chitosan-based catalyst in the Fischer-Tropsch synthesis and the features of the formation of the structure of such a catalyst have been studied. It is shown that the nature of the acids used at the preparation stage has a significant effect on the structure obtained by partial destruction of chitosan and the size of the nanocrystallites of the active phase, which, in turn, leads to significant changes in the activity of the catalyst and productivity for the target products - C_{5+} hydrocarbons.