

SUMMARY OF CONTENT

There are seven papers in this issue of the journal. The first paper *Acid Pre-Treatment and Enzymatic Saccharification of Sorghum Stalk for Cellulosic Ethanol Production*¹ investigates the effect of process variables during dilute acid pre-treatment and enzymatic saccharification of sorghum stalk for cellulosic ethanol production. The sorghum stalk was pre-treated at different reaction temperature (160 – 220 °C), dilute acid concentration (1 – 3 %v/v), solid/liquid ratio (0.06 – 0.15 g/ml) and time (5 – 15 mins). This was followed by fermentation to production and characterization of ethanol. Optimum conditions for pre-treatment were reaction temperature of 210 °C, acid concentration of 3 % v/v, solid/liquid ratio of 0.1 g/ml and a reaction time of 10 mins. Maximum percentage reducing sugar at this condition was 14%. The result of ethanol characterization as shown in the paper revealed that the ethanol production meets the ASTM standard. As result of this, the authors conclude that sorghum stalk is a potential feedstock for the production of bioethanol.

In the second paper *Mass-Transfer Modelling of the Active Step in the Synthesis of a Novel Catalyst for Biodiesel Production*² the authors study the use of the Progressive Diffusion Reaction Model (PDRM) in modelling the graft polymerization of 4-Chloromethylstyrene unto irradiated polyethylene substrates. The graft polymerization process being modelled is the active step in the synthesis of a novel polymer-based catalyst for biodiesel production. Experimental data for the graft polymerization process and certain process data needed for the modelling were evaluated from literature. The PDRM was derived from material balance equations on a spherical particle with a hypothetical reaction hold-up. The R² and t-Test values between experimental and model generated data were investigated for model validity with an R² value > 0.85 and t-Test value > 0.05 considered as the criteria for validity. The PDRM gave R² values greater than 0.85 and t-Test values greater than 0.05 at temperatures of 40°C, 50°C and 60°C for polyethylene samples with irradiation dosages of 20kGy, 30kGy, 40kGy and 50kGy respectively. The model was applied in generating concentration data for the grafting process at shorter time intervals and at process conditions not experimented upon. The authors conclude that the PDRM proved valid for modelling the grafting process at the various temperatures and irradiation doses. They recommend it for modelling other such operations.

Oloyede et al³ in the third paper *Effect of cooling rate on Microstructure - Properties Relationship of Grey Iron Cast in Sand and Metal Moulds* focus on the effect cooling rate of different moulds on the microstructure (graphite flakes size, distribution) and mechanical properties of grey cast iron. They used two common mould materials namely commercial silica sand and an industrial solid waste of Ferro chrome (Fe-Cr) slag. The moulds were produced using Sodium silicate-CO₂ process. Three kinds of moulds of Fe-Cr slag, silica sand and combination of these two were made. After ensuring optimum mould properties grey cast iron castings were performed on these moulds. The Cast iron was melted in and similar item of same geometry were cast using these three different moulds. The results obtained are said to have shown that Fe-Cr slag mould reveals faster cooling rate

¹ I. A. Mohammed., U. Musa, M. Auta, M. U. Garba, A. A. Faruq and J. C. Godspower

² S. K Otoikhian, B. Agbodekhe, E.O. Aluyor, T.O.K Audu,

³Oloyede, Olamilekan R. Uyime Donatus. Andem, Kenneth E

tes, followed by mixed mould, and finally sand mould. Faster heat transfer in slag moulds facilitated to obtain castings with fine microstructure, shorter and uniformly distributed graphite flakes. The microstructure result reveal graphite string lengths to be 26.18, 63.12 and 38.62 μm for castings made from the slag, silica sand and combination of these two moulding materials respectively. The effect of microstructure changes on the as-cast mechanical properties such as the hardness, tensile strength and creep properties were observed in each mould as-cast. They observed improved ductility and impact toughness in slag mould castings than either sand or mixed moulds. This improvement of ductility and impact toughness was observed to be 52% and 33% respectively. Fractography analysis of sand castings shows a rough and cleavage fracture surface due to the presence of large flaky structure of graphite in the iron matrix. The authors conclude that whereas in Fe-Cr slag mould castings which have a flake size of relatively smaller when uniformly distributed reveal largely mixed mode of fracture.

The paper on *Field, Petrographic and Geochemical Studies of Basement, Clastic and Carbonate Petroleum Reservoirs in The Northern Benue Trough, Nigeria*⁴ presents field, petrographic and geochemical evidences to show the occurrences of oil in basement reservoir rocks (Precambrian Older Granite), clastic reservoir rocks (Cretaceous Bima Formation) and carbonate reservoir rock (Cretaceous Yolde Formation) of the northern Benue Trough. The studied oils which occur as brittle solids and viscous fluids in the fractures and/or pore spaces of the studied rocks are believed to have been emplaced into fractures and pore spaces of the studied rocks as conventional light oils that have now been degraded to bitumen by biodegradation and water washing processes. TIC fragmentogram of the saturate fractions of the studied oils show the presence of unresolved complex mixture (UCM) humps, consistent with biodegraded oils. The authors state that sterane maturity parameters for the studied oils and their corresponding trisnorhopane thermal indicators (Ts:Tm ratio) are consistent with the thermal maturity values of petroleum source rocks within the oil window. Ternary plot of the relative amounts of C₂₇, C₂₈, and C₂₉ regular steranes in the studied oils show marked resemblance for oils occurring in the Precambrian granitic rocks and the Bima Formation, suggesting the two oils originated from the same petroleum source rock. They conclude that oils occurring in the studied Yolde Formation originated from a different petroleum source rock, implying the existence of multiple petroleum source rocks in the Northern Benue Trough.

In *Material Balance Equation (MBE) for Gas-Condensate Reservoirs*, Ramadan and Shedid⁵ observe that the phenomenon of retrograde condensation occurs when the reservoir pressure declines below the dew-point pressure causing gas condensation and developing two-phase flow. They state that material Balance Equation (MBE) of gas condensate reservoirs is a real challenge because of the change in fluid composition and complexity of phase behaviour. In their view, neglecting the effect of water vaporization may lead to inaccurate predictions of the material balance equation. The objective of their study is to develop an improved MBE model capable of describing gas condensate reservoirs under significant vaporization of connate water and water influx driving mechanism. They developed a new parameter to consider water vaporization. This parameter is used to derive equations for gas condensate reservoirs considering

⁴ Uriah Alexander Lar, Timothy P. Bata Hyeladi U. Dibal, Raymond I. Daspan, Lekmang C. Isah, Ajol A. Fube, Dieter A. Bassi

⁵ Ahmed H. Ramadan, Shedid A. Shedid

vaporization effect with and without consideration of water influx. Further, they developed and used numerical examples to compare the accuracy of the newly-developed model with conventional ones, using actual reservoir depletion and production data. Their results indicated that water vaporization has an important effect and should be considered for accurate MBE predictions. Error analysis showed that the newly-developed equations are more accurate than previously-developed models. The accuracy of the new MBE is attributed to the additional parameter introduced considering high pressure and high temperature conditions. According to the authors, the application of the new material balance equation will have important impact on predictions of initial gas in place, reserve calculation and future simulation studies.

Omonusi and Okologume⁶ in *A Simplified Model to Perform Nodal Analysis for Oil Wells: A Novel Prediction Method* developed a simplified sub-model (Rotimi and Wilfred model) for performing Nodal Analysis for a production system without displaying charts from an existing complex model (Guo-Ghalambor). In the course of simplifying the complex Guo-Ghalambor model, its challenges were first solved analytically using differential calculus to obtain a sub-model so that an iteration method such as Newton Raphson, coupled with advanced computer programming used to arrive at a definite solution. With the use of computer model, NODARES, nodal analysis was conducted for a range of data points. The results obtained from the tool revealed that, convergence is fast on the part of using the Rotimi and Wilfred model to perform nodal analysis. The computer model was validated using a range of data points in the determination of the operating pressure and flow rate at which the crude oil will be produced. They assert that a comparative analysis between Excel Solver and the computer model proved that NODARES is most suitable to perform nodal analysis without displaying charts. For visual representation, they used Poettmann Carpenter model to perform nodal analysis.

The last paper, *Effects of Source, Receiver and Offset Parameters in 3D Seismic Data Quality in Niger Delta*⁷ is on data acquisition in 3D seismic, and elements that influenced such data acquisition. The authors assert that such elements may range from lithological features, terrain, or environmental conditions to acquisition design parameters, instrumentation, and data collection style. They consider the design parameters used for orthogonal geometry seismic acquisition and how they influence data quality of surveys carried out using the 3D technique in the Nigeria Niger Delta region. The study presents an investigation on six 3D seismic acquisition design data for land seismic explorations in the region. The design parameters were divided into three categories of source parameters (parameters related to the source or shot events), the receiver parameters (parameters related to the receivers), and the offset parameters i.e. maximum offset, minimum offset, and largest minimum offset. The categories were independently compared with the nominal fold obtained in each acquisition data studied. They carried out regression analyses to adequately compare the nominal fold and the investigated parameters. Mathematical expressions showing the relationships between these parameters and the nominal fold were obtained from the generated regressions. The source point interval, receiver point interval and the minimum offset were observed to show no direct relationship with the nominal fold. The source line interval, the receiver line interval and the number of receiver lines showed a linear relationship with the nominal fold. They observed that a trend line exists between the number of source

⁶ Rotimi Omonusi and Wilfred C. Okologume

⁷ Ernest I. Ukut, and C. L. Eze

lines, the total source line length, total receivers, the receiver line length, the maximum offset, and the largest minimum offset (LMO).