

SUMMARY OF CONTENT

This issue of the journal contains six articles. The first article *Removal of Polycyclic Aromatic Hydrocarbons (PAHs) from Spiked Aqueous Solutions and Synthetic Petroleum Refinery Wastewater Using Organo-bentonite (Part 1)*¹ is a study of Polycyclic aromatic hydrocarbons (PAHs), a group of priority pollutants that are persistent, ubiquitous, and toxic, and are released to the environment through natural and anthropogenic sources. The effectiveness of bentonite clay modified with hexadecyl pyridinium bromide was explored for the removal of five PAHs, fluorene, phenanthrene, anthracene, fluoranthene and benzo[k]fluoranthene from spiked aqueous solutions and synthetic petroleum refinery wastewater. Series of studies were carried out using batch and fixed-bed column adsorption methods. The effects of various experimental parameters such as pH, mass of sorbent, contact time and temperature on adsorption were evaluated in a series of batch experiments. The selected working parameters were then used in the fixed-bed column experiment. The removal efficiency of the adsorbent in the batch method ranged from (84 to 97 %) while for the fixed-bed column adsorption it ranged from (93 to 99 %). Removal of the PAHs from the synthetic petroleum refinery wastewater was higher (91 to 99 %) than that from spiked aqueous solutions (84 to 97 %). The research study showed that the adsorption affinities were related to the hydrophobicity of the PAHs as determined by their log Kow values which were in the order; benzo[k]fluoranthene > fluoranthene > anthracene > phenanthrene > fluorene.

The second paper *Kinetics, Isotherms and Thermodynamics Modeling of PAHs Adsorptions onto Organo-Bentonite. (Part 2)*² is a follow-up of the first paper and it investigates the kinetics, isotherm, and thermodynamic behavior of five PAHs (fluorene, phenanthrene, anthracene, fluoranthene and benzo[k]fluoranthene) for their adsorption onto a Nigerian bentonite clay modified with hexadecylpyridinium bromide. The authors evaluated kinetic models of pseudo-first order (Lagergren) and pseudo-second order (Ho–McKay) for the kinetic studies and intra-particle diffusion (Weber and Morris) model was applied for the adsorption mechanism. The results suggest the better applicability of pseudo-second order model (> 0.99), and the mechanism of the adsorption was found to be intra-particle diffusion with occurrence of some other mass transfer mechanisms. Among the isotherms, Langmuir, Freundlich and Temkin models were used for the equilibrium studies, Langmuir isotherm models exhibited the best fit (> 0.80). The calculated values of R_L and n were between 0-1 and $n > 1$ respectively, indicating the favorability of the adsorption process. The thermodynamic parameters: Gibb's free energy change, ΔG was found to be negative, indicating that the adsorption process was spontaneous and feasible. The positive values of the enthalpy ΔH and entropy ΔS changes indicate the endothermic nature of the adsorption process and increase in the degree of randomness at the solid–liquid interface as well as good affinity of PAHs towards the adsorbents.

The study in the third paper *Geothermal Energy Reservoir Characterization; Case Study of Bunter Reservoirs, Zuid Holland, Netherlands*³ focused on the basis of the effort by the Delft University of Technology to produce hot water for heating purposes (Delft

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Geothermal Project, DAP). The Buntsandstein Reservoirs of the Triassic Detfurth and Volpriehausen Formations in the West Netherlands Basin have been identified and delineated for geothermal energy development. The objective was to identify the quality and indicate the distribution of these geothermal energy reservoirs for the purpose of generating electricity. In the light of this, four seismic surveys are interpreted and integrated with well data, which are analyzed and interpreted for stratigraphic and structural frameworks, followed by analysis of petrophysical properties. Two porosity/permeability relationships are used for calculating net-to-gross (N/G) at various permeability cut-offs such as 0.1mD, 1mD, 10mD and 100mD. Net sand ranges from 0.14m to 58.04m for 10mD and 0.1mD permeability cut-offs, respectively. Based on different scenarios the average porosity ranges from 6.5% to 16.2% and N/G ranges from 0.6% to 30.8%. The authors observed that heterogeneity remains an issue of concern but observed that they will generally not serve as a barrier or baffle to flow. The zone in and around Wells MON-03, P18-A-02, P15-01 and P15-14 in the central part of the study area show the best reservoir intervals based on average porosity and N/G values. They recommend the zone as the most plausible for the geothermal energy development project, as it is also characterized with depths in the excess of 3,000m and estimated temperatures in excess of 140°C, which are well above the required values for generating electricity.

The fourth paper, *Performance Evaluation and Analysis of Operating Margin of Emission Factor of Ibom Power Plant*⁴ evaluates and analyses the performance of Ibom Power Plant from 2014 to 2016 based on performance indices such as capacity factor, load factor, plant capacity, utilization factor, overall efficiency, and thermal efficiency. The operating margin which is the emission factor (CO₂ emission factor) that refers to the group of existing power plants whose current electricity generation would be affected by the proposed clean development mechanism (CDM) project activity was also determined. Data obtained from the Power Plant inventory records and fault logbook includes monthly energy generation and number of failures for the period under study. Results obtained from the analysis showed that the average capacity factor was 28.89%, the typical load factor as calculated was 88.23%; plant capacity was estimated to be 1,673,160MWH and the average generating capacity from plant records was 483,333.84MWH. The averages of the overall and thermal efficiencies were 27.37% and 27.92% respectively. Using the CO₂ emission factor of 56 KgCO₂/GJ, the weighted operating margin emission factor (EF_{OM,y1-y3}) was determined to be 26.17 KgCO₂/MWH and this was attributed to increase in economic activities in Akwa Ibom State. Key issues responsible for the power plant's low performance were found to be as a result of breakdown or failures, disruption of gas supply and other such factors.

For the fifth paper on *Ensemble Histogram a tool for Geostatistical Realization Validation: Hatch Field Niger Delta Basin, Nigeria*⁵, the authors had unhindered access to seismic data, Well log data and 3D object generated training image for the study and their visual inspection of the seismic data revealed channel fills in Hatch field Offshore Niger Delta Basin. Two continuous reservoirs named reservoir-D and reservoir-E were penetrated by four and five wells and their lithofacies correlated across the field. The reservoirs in the field were investigated for their lithofacies and channel sand distribution using Multiple Point Geostatistics algorithm of Single Normal Equation

⁴ Y. N. Udoakah, I. G. Okure, and U. B. Akpanedet

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Simulation (SNESIM) and Filter-based Simulation (FILTERSIM). The results from the simulations revealed that the training image mean, and variance is 0.60083 and 0.239835. The mean and variance ensemble histogram for reservoir-D using SNESIM algorithm is 0.598 and 0.240, and that for reservoir-E is 0.599 and 0.240. The mean of means and the mean of the variance ensemble histogram for reservoir-D using FILTERSIM algorithm is 0.681 and 0.217, and that for reservoir-E is 0.683 and 0.216. The results shows that the SNESIM algorithm shows greater similarity to the training image mean and variance than the FILTERSIM algorithm and thus would be preferred in Hatch field.

The sixth paper is an *Investigation of Oil Shale Response Using Terahertz-Time Domain Spectroscopy*.⁶ It describes Oil Shale as an unconventional source of fuel distributed across the world with only few active explorations due to the competitive advantage price of crude oil and natural gas. The authors observe that oil shale holds important application in the context of a decline in the crude oil reserves and a spike in the oil prices. They further explain that in order to prepare for the futuristic tail off in the conventional oil sources, efforts have since been geared towards evaluating the oil yield potential of oil shale of different countries. This study is a concise summary of related research in the study of oil shale analysis with particular emphasis on the Nigerian oil shale. They identified the shortcomings in the adopted techniques and suggested the complementation of a Terahertz-Time Domain Spectroscopy THz-TDS. Other than the indigenous Fischer Assay method of oil shale analysis, a combination of at least one other technique is usually incorporated in the analysis they further noted. The potential of the supplementary THz-TDS technique to yield perceptive results was addressed with promising recommendations to enhance the performance of the technique.

⁶ Moses Eshovo Ojo, Patrick Mounaix and Damien Bigourd