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Desulphurization of heavy crude oil by irradiation process

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Microwave energy is slowly becoming the most diverse form of energy transfer and has been used in the petroleum industry for inspecting coiled tubing and line pipe, measuring multiphase flow and the mobilization of asphaltic crude oil. It is now being used to synthesize pharmaceuticals and biological samples, along with its widespread use in the materials, metals and glass industries to inorganic synthesis, sinter and cure countless parts and powders. Though its implications in petroleum applications are yet to be fully understood, the non-thermal aspects of energy transfer between microwaves and other forms of matter are always visible in processes where microwave energy is used to cause a chemical or physical change in the irradiated material. Nearly every time that this form of energy transfer is employed in the chemical or physical transformations of a sample there is a noticeable reduction in the kinetic and thermodynamic requirements of the specific process as compared to conventional processes, thus making it attractive to the petroleum industry. Global dependence on oil from regions where conflicts have raged for decades is a major contributory factor in deepening the economic crisis. Oil companies are taking measures to make sure that the economic crisis does not deepen to a point of disparity, which have included huge investments in the bitumen and heavy oil industry. In Canada, efforts have been intensified to develop microwave irradiation technology for *in-situ* enhanced oil recovery of the country's large deposits of bitumen and heavy oil. Of the estimated 30 billion barrels of heavy oil in place, about 26 billion barrels are considered unrecoverable using the current technology. The microwave technology improved recovery by 20 percent with no discharge of greenhouse gas (GHS) into the environment. The new technology employs specific frequency microwaves targeted into the formation containing heavy hydrocarbons to initiate conversion of the hydrocarbon into synthetic crude. The results of work done so far showed strong indications for the microwave technology to be employed not only for hydrocarbon extractions but also for *in-situ* upgrading and field upgrading of heavy oil and bitumen (to drastically reduce oil viscosity for pipeline transportation without the use of diluents), desulphurization of crude oil and future upgrading of coal and oil shale. As much as 80 percent reduction in sulphur content of heavy oil has been obtained with microwave irradiation. Overall, the microwave technology presents the best alternative, economically and environmentally, to the existing technologies for enhanced oil recovery operations and processing.

Biography

Adango Miadonye, Professor of Chemical Engineering and Industrial Chemistry in the School of Science & Technology has received global recognition in the field of petroleum engineering and petroleum chemistry. His impressive publication record includes 80 peer-reviewed articles, numerous book chapters, and a number of presentations at important international conferences. An accomplished and respected student supervisor, Prof. Miadonye is extensively cited and has also formed the basis for a number of industrial collaborations. Well-respected by his colleagues nationally and internationally, Prof. Miadonye has been a leader and contributor to his professional academic community holding offices and serving on committees with numerous academic and professional societies.

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