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Effects of Crystal Planes in Wax Deposition on Fe_2O_3 Pipeline Surface using Adsorption Locator Model

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The most common problem in the production and transportation of crude oil in pipelines is wax deposition which is largely caused by temperature drop. Continuous accumulation of wax may cause reduction in pipeline effective cross-sectional area which leads to increased pressure demand, or pipelines clogging and eventually abandonment. Several mathematical models and experimental laboratory loops have been used to predict wax deposition in pipelines, but most of the models neglected the effects of shear which resulted into over estimation of wax deposition. On the other hand, the loops are limited to frictional pressure drop and lacked direct measurement during experiment which is time consuming. The strength of molecular dynamic in predicting wax at atomic level offers a powerful application in wax deposition study. The aim of the study is to investigate the effects of crystal planes on the Fe_2O_3 pipeline surface to wax deposition using adsorption locator model. The $\text{C}_{20}\text{H}_{42}$, $\text{C}_{22}\text{H}_{46}$ and $\text{C}_{24}\text{H}_{50}$ hydrocarbons and the (001), (111) crystal planes were used in this study. The distribution of energy for each adsorbate component and energy released or required for adsorbate relaxation on the surface were computed. The results show that there is no energy different for different crystal planes of the same hydrocarbon; also different hydrocarbons have shown different energy values for the same crystal plane. The results have revealed that wax deposition is independent of crystal surface orientation but is dependent on carbon number. Higher hydrocarbons show low adsorption energy and thus favors wax deposition.

Biography

Ballo. M. Lonje is a Doctoral degree candidate at China University of Petroleum (East China) since September 2017 under supervision and mentorship of Professor Liu Gang. His research direction is Modeling wax deposition in pipelines. He graduated Master of Science in Renewable Energy (Hydropower) from the University of Dar es Salaam in Tanzania (2015). He possess teaching experience of over twelve years of Lecturing and supervising students' projects in Mechanical and Energy and production at Mbeya University of Science and Technology, Tanzania.