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Modelling and simulation of fluid flow and heat transfer in a micro CAPRI reactor

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The CAtalytic upgrading PRocess In-situ (CAPRI) is a way to further enhance the upgrading arising from the Toe-to-Heel Air Injection (THAI) process. A two-dimensional (2D) reactor model has been developed to simulate the flow behaviour in a micro CAPRI reactor within the tar sand reservoir during the use of the (THAI) enhanced oil recovery process. The reactor was based on a cylindrical core taken from packed catalyst in other to simulate the underground conditions. The focus will be on fluid flow in the CAPRI process enhanced oil recovery technique. The effect of process parameters, including temperature, flow rate, feed concentration and coke deposition on the catalyst bed was investigated over a range of conditions. Computational fluid dynamics (CFD) code Fluent was employed as the tool for carrying out this study. The effects of reaction temperature and weight hourly space velocity (WHSV) on catalytic upgrading of heavy oil were also investigated. The simulation results show that feed conversion and coke deposition are affected by operation conditions investigated in this work. Increase in reaction temperature and decrease in WHSV, causes an increase in catalyst deactivation during the catalytic upgrading process. Therefore is expected that the results could be useful to improve the process performance.

Biography

Paul Dim is a PhD candidate at The University of Nottingham in the UK. His research interest includes reservoir simulation, characterization of porous media, catalysis and enhanced oil recovery. Paul holds BEng and MEng in Chemical Engineering from Federal University of Technology Minna, Nigeria.

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