Estimation of diffusion coefficients of H2 in heavy oil from pressure decay tests: An analytical approach

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An estimation of mass transfer parameters in H2 - Vacuum Residue system for a hydrocracking-based heavy oil upgrading process is presented. The experiments were carried out on a 250cc batch reactor (by Parr Instrument Co.). The experimental pressure-decay data with time were used to measure molecular diffusivity and solubility of H2 in heavy oil. A Fick's laws-based convenient analytical solution was introduced to estimate above mentioned parameters. The results were shown at different operating temperatures and different liquid properties for comparison. A value of 5x10-7 [m2/s] was found as a preliminary result of H2 diffusivity into the vacuum residue.