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Alireza Rostami, Hojatollah Ebadi, Milad Arabloo, Mahdi Kalantari Meybodi, Alireza Bahadori

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Toward Genetic Programming (GP) Approach for Estimation of Hydrocarbon/Water Interfacial Tension

Alireza Rostami ¹, Hojatollah Ebadi ¹, Milad Arabloo ^{2*}, Mahdi Kalantari Meybodi ¹,
Alireza Bahadori ³

¹ Department of Petroleum Engineering, Petroleum University of Technology (PUT), Ahwaz, Iran

² Department of Chemical & Petroleum Engineering, Sharif University of Technology, Tehran, Iran

³ School of Environment, Science and Engineering, Southern Cross University, Lismore, NSW, Australia

*Corresponding author, Email: milad.arabloo@gmail.com

Tel: +98-917140 5706

Abstract

The interfacial tension (IFT) of water-hydrocarbon system is one of the most important parameters in various fields of chemical, petroleum and process industries. Laboratory measurement of interfacial tension is laborious, time demanding and involves costly experimental setup. Current study presents genetic programming (GP) as a powerful tool in order to develop a novel correlation for estimation of IFT in hydrocarbon-water systems under wide ranges of experimental conditions. To achieve this mission, a comprehensive databank comprising 1075 experimentally measured data points were acquired from the literature reports. Four influencing factors of hydrocarbon critical temperature, experiment temperature, pressure and water/hydrocarbon density difference were considered as independent correlating variables to design and develop the genetic model. Comprehensive error analysis demonstrates the superiority of the proposed genetic model with $R^2=0.91$ and AARD=4.38% in comparison with literature data. The predictability of the genetic model was further compared with a recently published model and other well-known empirical correlations reported in literature. The result suggests that the proposed tool is of great value for fast and precise estimation of water/hydrocarbon IFT.

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