Development of data-driven conversion prediction model for atmospheric residue desulfurization process

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In the refinery plants, Atmospheric Residue Desulfurization(RDS) process is used to remove sulfur, nitrogen, Conradson Carbon Residue(CCR), and metallic impurities(Ni, V, etc.) in High Sulfur Atmospheric Residue(HS-AR). In this study, we develop neural network models to predict the conversion of RDS processes. The catalysts in the RDS system are replaced every 6-8 months and the characteristics change accordingly. In addition, it is difficult to construct first-principle modeling for the CCR remove reaction and for the catalysts aging. Thus, we construct a data-driven model for the prediction of conversion with the selected features such as hydrogen flow rate, reactor temperature, and cumulative sum of total feed flow rate. Using the real data during 6 months, we train and test the neural network that can predict the composition of Treated Atmospheric Residue(T-AR) produced. This work is supported by the Korea Agency for Infrastructure Technology Advancement(KAIA) grant funded by the Ministry of Land, Infrastructure and Transport (No. 21ATOG-C162087-01), and by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MSIT) (NRF-2021R1C1C1004217).