

A Non-Catalytic, Supercritical Methanol Route for Effective Deacidification of Naphthenic Acids

Muhammad Kashif Khan¹, 김재훈^{2,3,†}

¹성균관대학교; ²성균관대학교 기계공학부; ³SKKU Advanced Institute of Nano Technology (SAINT)

(jaehoonkim@skku.edu[†])

High acid crudes contain large amount of naphthenic acids(NAs), which lead to severe corrosion in oil refinery equipment and serious environmental problems. The goal of this study is to develop a non-catalytic supercritical methanol (scMeOH) route for effective deacidification of NA mixtures. Various reaction parameters, including temperature, pressure, reaction time and NA-to-methanol ratio, are explored. Almost complete TAN reduction (96.9%) is achieved at 400 °C, 10 MPa, and 3 h. The chemical composition of the liquid products obtained under the different reaction conditions, analyzed using gas chromatography-mass spectroscopy, show that esters are the most abundant species. The most recalcitrant NA species, which remained after the reaction, are found to be 2-ethyl-2,3,3-trimethyl-butanoic acid and 2,3-dimethyl-2-(1-methylethyl)-butanoic acid. This is attributed to the branched hydrocarbons located near the carboxylic acid groups, which hinder the access of methanol molecules.