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Extraction and recovery process to selectively separate aromatics from naphtha feed to ethylene crackers using 1-ethyl-3-methylimidazolium thiocyanate ionic liquid

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ABSTRACT

Naphtha feed to ethylene crackers is an industrial stream of interest to form part of the habitual main sources of aromatics, pyrolysis and reformer gasolines, in order to reduce the costs caused by the non-converted aromatics in the ethylene crackers. Nonetheless, its lower aromatic concentration (10–25 wt. %) in comparison with gasolines (over 50 wt.%) has limited the implementation of the now-used technologies. Ionic liquids (ILs) arise as alternative solvents to current-used organic solvents, since the ILs are capable to selectively extract aromatic from a low-concentrated stream as is the naphtha feed to ethylene crackers. Accordingly, 1-ethyl-3-methylimidazolium thiocyanate ([emim][SCN]) has been selected to conceptually design the liquid–liquid extraction alternative process to separate BTEX from a naphtha model since this IL has shown the highest values of aromatic/aliphatic selectivity. The process simulation was based on experimental liquid–liquid equilibria (LLE) and vapor–liquid equilibria (VLE) data, the latter destined to plan the hydrocarbon recovery from the extract stream. Kremser method for extraction and a new algorithm for flash distillation units were used to simulate the process and select the most favorable working conditions to increase the purity of aliphatics in the raffinate stream and the purity in the aromatic stream obtained.

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