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Dearomatization of pyrolysis gasoline by extractive distillation with 1-ethyl-3-methylimidazolium tricyanomethanide

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ABSTRACT

This work proposes the use of the extractive distillation with ionic liquids (ILs) for the separation of aromatics from pyrolysis gasoline to overcome liquid-liquid extraction limitations. Among all the ILs proved so far, 1-ethyl-3-methylimidazolium tricyanomethanide ([emim][TCM]) stands as the most promising in the extractive distillation of aromatics due to its high and compensate aromatic/aliphatic selectivities and aromatic distribution ratios, high thermal stability, and low viscosity. The separation of benzene, toluene, and xylene (BTX) from a pyrolysis gasoline model was experimentally investigated to check the real suitability of the [emim][TCM] for extractive distillation. A shortcut model, Fenske-Underwood-Gilliland-Kirkbride (FUGK) model, was used to simulate the extractive distillation column. A shortcut simulation of the flash distillation unit destined to separate the BTX from the IL was also accomplished. On the other hand, the quantum chemical-based simulation methodology (COSMO-based/Aspen Plus) was used to simulate the extractive distillation process rigorously. Overall, homogeneous extractive distillation with [emim][TCM] was revealed as a feasible and potential process to separate BTX from pyrolysis gasoline, showing an enhanced technology in comparison with the widely studied liquid-liquid extraction.

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