

Design, optimization and integration of the distillation process for separating plastic pyrolysis oil

Hongkang Zhao¹, Mengyuan Li², Yuyang Zheng², Nan Hu², Shiji Xu², Xing Yuan², and Qunsheng Li¹

¹Beijing University of Chemical Technology

²Affiliation not available

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Abstract

Plastic waste and debris have caused substantial environmental pollution globally. In this work, a new engineering concept of the mobile recycling platform for plastic waste is proposed. And a four-column distillation scheme for separating plastic pyrolysis oil was built for the mobile recycling platform. Firstly, a VOF CFD simulation was conducted to reveal the liquid flow characteristics along and inside the ϕ -ring, and then based on the CFD data and theoretical analysis, an optimization model for the packing ring was proposed to design the wavy ring. Secondly, the novel wavy rings were applied in the four-column distillation experiment, and acetophenone (99.68w%) and phenol (98.94w%) were separated from the pyrolysis oil. Finally, the heat integration of the four-column distillation scheme and the engineering economic analysis of the mobile recycling platform were carried out. The results indicate that the mobile recycling platform is feasible in terms of theory, technology, and economics.

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