

### **293d Separation of P-Xylene from the Ternary Xylene System by Distillative Freezing**

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Due to the very close boiling points of p-xylene (PX, bp=138.37°C), m-xylene (MX, bp=139.12°C), ethylbenzene (EB, bp=136.19°C), it is very difficult to separate them by conventional distillation. A new separation technique, called distillative freezing (DF), has been successfully applied to separate PX from a liquid mixture of 10% MX and 90% PX (Shiau et al., 2005). Basically, the DF process is operated at triple point condition, in which the liquid mixture is simultaneously vaporized and solidified due to the three-phase equilibrium. It results in the formation of pure solid, and liquid phase and vapor phase of mixtures. The process is continued until the liquid phase is completely eliminated and only the pure solid crystals remain in the feed. Distillative freezing (DF) will be applied in this work to separate and produce the solid PX crystals from the ternary xylene liquid mixtures containing m-xylene (MX), p-xylene (PX) and ethylbenzene (EB). The results indicate that, when the DF experiments are performed based on the simulated adiabatic DF operation, solid PX crystals can be produced and the purity of PX crystals can reach 99.5%~99.9 for the ternary xylene liquid mixtures of MX, PX and EB with PX ranging from 83% to 90%.

Shiau, L. D.; Wen, C. C.; Lin, B. S., "Separation and purification of p-xylene from the mixture of m-xylene and p-xylene by distillative freezing" *Ind. Eng. Chem. Res.* 2005, 44, P2258-2265.