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Chunli Li, Yuanyuan Song, Jing Fang, Yang Liu, Weiyi Su, Yuqi Hu

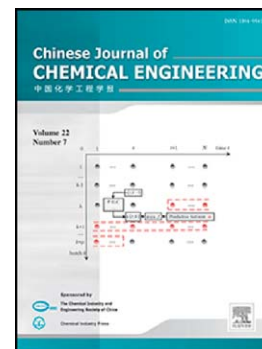
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Separation process of butanol-butyl acetate-methyl isobutyl ketone system by the analysis to residual curve and the double effect pressure-swing distillation[☆]

Chunli Li^{*}, Yuanyuan Song, Jing Fang, Yang Liu, Weiyi Su, Yuqi Hu

School of Chemical Engineering and Technology, Hebei University of Technology, Tianjin 300130, China¹

Abstract The separation of ternary mixture of butanol, butyl acetate, and methyl isobutyl ketone (MIBK) was initially analyzed by the residual curve. In this process, MIBK was chosen as the azeotropic agent during the first step of separation. The optimum mass ratio of extra MIBK was 1.6 in the modified feed stream according to the residual curve. Thus on this condition the top product was butanol-MIBK azeotrope while the bottom product was butyl acetate in the preliminary separation of the mixture. Then the butanol and MIBK azeotrope was separated by the double effect pressure-swing distillation with the low pressure column performing at 30 kPa and the atmospheric pressure column at 101 kPa. The optimal operating conditions were then obtained by using Aspen Plus to simulate and optimize the process. The results showed that the mass purities of butanol, butyl acetate, and MIBK were all more than 99 % and reached the design requirements. Additionally, compared with the traditional distillation with outside heating, the double effect pressure swing distillation saved the reboiler duty by 48.6% and the condenser duty by 44.6%.

Keywords: Residual curve; Azeotropic distillation; Pressure-swing distillation; Aspen Plus

1 INTRODUCTION

As important industrial raw materials, butyl acetate, butanol, and methyl isobutyl ketone

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^{*} Corresponding author.
E-mail address: ctstlcl@163.com (C.Li).

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