Accepted Manuscript

A novel process integrating vacuum distillation with atmospheric chlorination reaction for flexible production of tetrachloroethane and pentachloroethane

Xian Chen, Yunpeng Li, Ge Xu, Jihai Tang, Zhuxiu Zhang, Ming Chen, Zhaoyang Fei, Mifen Cui, Xu Qiao

PII: S1004-9541(17)30710-3
DOI: doi:10.1016/j.cjche.2017.10.023
Reference: CJCHE 975

To appear in:

Received date: 7 June 2017
Revised date: 25 September 2017
Accepted date: 24 October 2017

Please cite this article as: Xian Chen, Yunpeng Li, Ge Xu, Jihai Tang, Zhuxiu Zhang, Ming Chen, Zhaoyang Fei, Mifen Cui, Xu Qiao , A novel process integrating vacuum distillation with atmospheric chlorination reaction for flexible production of tetrachloroethane and pentachloroethane. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Cjche(2017), doi:10.1016/j.cjche.2017.10.023

Process Systems Engineering and Process Safety

A novel process integrating vacuum distillation with atmospheric chlorination reaction for flexible production of tetrachloroethane and pentachloroethane*

Xian Chen[1], **Yunpeng** Li[1], **Ge** Xu[1], **Jihai** Tang[1,2,**] **Zhuxiu** Zhang[1], **Ming** Chen[1], **Zhaoyang** Fei[1], **Mifen** Cui[1] , **Xu Qiao**[1,2,**]

[1] State Key Laboratory of Materials-Oriented Chemical Engineering, College of Chemical Engineering, Nanjing Tech University, Nanjing 210009, China

[2] Jiangsu National Synergetic Innovation Center for Advanced Materials (SICAM), Nanjing 210009, China

Abstract In this paper, we developed a novel process integrating vacuum distillation with atmospheric chlorination reaction (VD-ACR) to realize the flexible production of tetrachloroethane (TeCA) and pentachloroethane (PCA) from 1,2-dichloroethane (DCA). During the simulation, the distillation column and reactors were operated for separation and chlorination respectively under variable pressures and temperatures. It is interesting to note that VD-ACR processes producing pure TeCA or PCA can exhibit the similar configuration parameters after optimization, which enables the flexible production of TeCA and PCA with different molar ratios via changing operating parameters. The molar ratio of TeCA/PCA can be fine-tuned within the range of 0.9:0.1~0.1:0.9 through adjusting the amount of chlorine pumped into side reactors, giving rise to the increase of the heat duty of reboiler by five times. A pilot-scale experiment was then operated based-upon this VD-ACR process and the result matched well with the simulation. Therefore, the VD-ACR model presented in this study will be beneficial for the industrial-scale flexible production of TeCA and PCA from DCA.

* Supported by the Natural Science Foundation of China (21276126, 61203020); Prospective Joint Research Project of Jiangsu Province (BY2014005-02, BY2015005-02); The Priority Academic Program Development of Jiangsu Higher Education Institutions (PAPD).

** To whom correspondence should be addressed.

E-mail address: jhtang@njtech.edu.cn (J.H. Tang), qct@njtech.edu.cn (X. Qiao).