

4 结论

合成的 1-甲基-3-丙磺酸基咪唑硫酸氢盐 [MIMPS][HSO₄] 功能化室温离子液体作为催化剂, 68% 的稀硝酸可与甲苯进行清洁硝化反应, 原料 n (催化剂): n (甲苯): n (硝酸) 为 1: 50: 150, 在 60 °C 下反应 10 h, 一硝化产率达 70.4%, 选择性为 100%, p/o 值为 0.7。通过简单的倾析就可实现硝化产物与催化体系的分离, 催化剂能够循环使用。该工艺符合绿色化学的发展方向, 具有良好的应用前景。

参考文献:

- [1] 吕春绪. 耐热硝基芳烃化学 [M]. 北京: 兵器工业出版社. 2000.
- [2] K. Smith, S. Almeer, Peters. Regioselective mononitration of aromatic compounds by zeolite/dinitrogen tetroxide/air in a solvent-free system [J]. *Chem Commun*, 2001: 2478–2479.
- [3] 易文斌, 蔡春. 甲苯的氟两相硝化反应研究 (I) [J]. 含能材料, 2005, 13(1): 52–54.
YI Wen-bin, CAI Chun. Nitration of toluene with fluorous biphasic system (I) [J]. *Chinese Journal of Energetic Materials (Hanneng Cailiao)*, 2005, 13(1): 52–54.
- [4] 易文斌, 蔡春. 甲苯的氟两相硝化反应研究 (II) [J]. 含能材料, 2006, 14(1): 29–31.
YI Wen-bin, CAI Chun. Nitration of toluene with fluorous biphasic system (II) [J]. *Chinese Journal of Energetic Materials (Hanneng Cailiao)*, 2006, 14(1): 29–31.
- [5] K Smith, S Liu, G A El-Hiti. Regioselective mononitration of simple aromatic compounds under mild condition in ionic liquids [J]. *Ind Eng Chem Res*, 2005, 44: 8611–8615.
- [6] K K Laali, V J Gettwert. Electrophilic nitration of aromatics in ionic liquid solvents [J]. *J Org Chem*, 2001, 66: 35–40.
- [7] S Koguchi, T Kitazume. Synthetic utilities of ionic liquid-supported NHPI complex [J]. *Tetrahedron Letters*, 2006, 47: 2797–2801.
- [8] R Rajagopal, K V Srinivasan. Ultrasound promoted para-selective nitration of phenols in ionic liquid [J]. *Ultrasonics Sonochemistry*, 2003, 10: 41–43.
- [9] N L Lancaster, V L Mestre. Aromatic nitrations in ionic liquids: the importance of cation choice [J]. *Chem Commun*, 2003: 2812–2813.
- [10] R Rajagopal, K V Srinivasan. Mono nitration of phenols with ferric nitrate in room temperature ionic liquid [J]. *Synth Commun*, 2003, 33: 961–966.

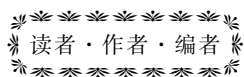
Green Nitration of Toluene in Ionic Liquids

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Abstract: Novel Brønsted ionic liquid 1-methyl-3-propanesulfonic acid imidazolium hydrogen sulfate [MIMPS][HSO₄] was prepared as catalyst for the green chemical processes of nitration reaction. Nitration reaction was carried out for 10 h at 60 °C with the catalyst to reactant molar ratio of 1: 50, and the yield of mononitration reaction was 70.4%, and selectivity of mononitration reaction was 100% with a para to ortho ratio of 0.7. Biphasic system of product and catalyst was obtained and the product could be separated simply by decantation. In addition, ionic liquid could be recovered and reused showing the possibility of a clean chemical process.

Key words: organic chemistry; ionic liquid; nitration reaction; clean process; toluene



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