

研究论文

过渡金属钌、铑配合物在室温离子液体中催化硅氢加成反应的研究

厉嘉云, 彭家建, 邱化玉, 蒋剑雄, 邬继荣, 倪勇, 来国桥

(杭州师范学院有机硅化学及材料技术教育部重点实验室 杭州 310012)

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摘要 研究了在室温离子液体以及室温离子液体/有机溶剂复合介质体系中, $\text{Rh}(\text{PPh}_3)_3\text{Cl}$, $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ 等催化烯烃与三乙氧基硅烷的硅氢加成反应. 实验结果表明, 在乙二醇二甲醚/离子液体1-丁基-3-甲基咪唑六氟磷酸盐(BMImBF_6) ($V/V=1/4$) 介质中, 于 $90\text{ }^\circ\text{C}$ 下, 己烯与三乙氧基硅烷反应的转化率为100%, β 加成物的选择性可达89.0%. 而用 $\text{Rh}(\text{PPh}_3)_3\text{Cl}$ 作为反应的催化剂, 在纯离子液体 BMImPF_6 中, 就可以高效催化烯烃与三乙氧基硅烷的加成反应. 过渡金属 $\text{Rh}(\text{PPh}_3)_3\text{Cl}$, $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ 催化剂/离子液体 BMImPF_6 催化体系, 不仅解决了产物与催化剂分离困难这一难题, 同时, 离子液体 BMImPF_6 的存在提高了过渡金属 $\text{Rh}(\text{PPh}_3)_3\text{Cl}$, $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ 催化硅氢加成反应的活性, 特别是 β 加成物的选择性. 反应结束后, 催化剂/离子液体与产物易于分离, 并且可以重复使用.

关键词 [硅氢化反应](#) [钌配合物](#) [铑配合物](#) [离子液体](#)

分类号

Study on Hydrosilylation Catalyzed by Transition Metal Rhodium and Ruthenium Complexes in Ionic Liquids

LI Jia-Yun, PENG Jia-Jian, QIU Hua-Yu, JIANG Jian-Xiong, WU Ji-Rong, NI Yong, LAI Guo-Qiao*

(Key Laboratory of Organosilicon Chemistry and Material Technology of Ministry of Education, Hangzhou Teachers College, Hangzhou 310012)

Abstract Alkene hydrosilylation catalyzed by $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ in ionic liquids/organic solvents and $\text{Rh}(\text{PPh}_3)_3\text{Cl}$ in ionic liquids was studied in this paper. Both catalytic activity and selectivity of $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ were improved in ionic liquid $\text{BMImPF}_6/\text{DME}$ medium. The conversion of hexene and selectivity of β -adduct for the hydrosilylation reaction of 1-hexene with triethoxysilane catalyzed by $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ in ionic liquid $\text{BMImPF}_6/\text{DME}$ ($V/V=1/4$) medium at $90\text{ }^\circ\text{C}$ were 100% and 89.0%, respectively. While the conversion of hexene and selectivity to β -adduct catalyzed by $\text{Rh}(\text{PPh}_3)_3\text{Cl}$ in sole BMImPF_6 at $90\text{ }^\circ\text{C}$ were 100% and 99.9%, re-spectively. The $\text{Rh}(\text{PPh}_3)_3\text{Cl}$ in BMImPF_6 catalyst system could be recovered easily and be reused more than three times without noticeable loss of its catalytic activity and selectivity. Alkene hydrosilylation catalyzed by $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ in ionic liquids/organic solvents and $\text{Rh}(\text{PPh}_3)_3\text{Cl}$ in ionic liquids was studied in this paper. Both catalytic activity and selectivity of $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ were improved in ionic liquid $\text{BMImPF}_6/\text{DME}$ medium. The conversion of hexene and selectivity of β -adduct for the hydrosilylation reaction of 1-hexene with triethoxysilane catalyzed by $\text{Ru}(\text{PPh}_3)_3\text{Cl}_2$ in ionic liquid $\text{BMImPF}_6/\text{DME}$ ($V/V=1/4$) medium at $90\text{ }^\circ\text{C}$ were 100% and 89.0%, respectively. While the conversion of hexene and selectivity to β -adduct catalyzed by $\text{Rh}(\text{PPh}_3)_3\text{Cl}$ in sole BMImPF_6 at $90\text{ }^\circ\text{C}$ were 100% and 99.9%, re-spectively. The $\text{Rh}(\text{PPh}_3)_3\text{Cl}$ in BMImPF_6 catalyst system could be recovered easily and be reused more than three times without noticeable loss of its catalytic activity and selectivity.

Key words [hydrosilylation](#) [rhodium complex](#) [ruthenium complex](#) [ionic liquid](#)

DOI:

通讯作者 厉嘉云 gqlai@hztc.edu.cn

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