

研究论文

溴化锌-卤化正四丁基铵高效催化合成苯乙烯环状碳酸酯

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摘要 溴化锌-卤化正四丁基铵二元催化剂高效催化合成苯乙烯环状碳酸酯, 当 $n\text{-Bu}_4\text{N}^+\text{I}^-/\text{ZnBr}_2$ 摩尔比为2时, 在短时间内(30 min)可将苯乙烯环氧化物几乎完全转化为环状碳酸酯, 无其它副产物的生成. 在 $\text{ZnBr}_2/n\text{-Bu}_4\text{N}^+\text{X}^-$ 的催化体系中加入 Au/SiO_2 氧化催化剂时, 能将苯乙烯直接氧化, 然后碳酸化实现“一锅法”制备环状碳酸酯. 在此合成路线中搭载的纳米金催化第一步苯乙烯环氧化反应; $\text{ZnBr}_2/n\text{-Bu}_4\text{N}^+\text{Br}^-$ 催化第二步 CO_2 环加成反应. 在温和的反应条件下(80 °C, 1 MPa, 4 h)将环状碳酸酯的产率提高到42%.

关键词 [苯乙烯环状碳酸酯](#) [苯乙烯](#) [苯乙烯环氧化物](#) [二氧化碳](#) [溴化锌-卤化正四丁基铵](#) [Au/SiO₂](#)

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Synthesis of Styrene Carbonate Catalyzed Efficiently by Zinc Bromide and Tetra-*n*-butylammonium Halides

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Abstract In this paper chemical fixation of CO_2 was introduced for the synthesis of cyclic carbonate. Styrene carbonate can be synthesized *via* two routes, one is the cycloaddition of CO_2 to epoxides and the other is oxidative carboxylation of styrene. The latter route couples the two processes, epoxidation of styrene and subsequent cycloaddition of CO_2 to the epoxide formed. In the present work, it is shown that a catalyst system of ZnBr_2 and $n\text{-Bu}_4\text{N}^+\text{X}^-$ ($\text{X}=\text{Br}, \text{I}$) has an excellent activity and selectivity for the cycloaddition of CO_2 to styrene oxide. At the $n\text{-Bu}_4\text{N}^+\text{I}^-/\text{ZnBr}_2$ molar ratio of 2, styrene oxide is quantitatively transformed to styrene carbonate with in a very short time(30 min). This catalyst system can be also applied for the oxidative carboxylation of styrene by combining with an epoxidation catalyst of Au/SiO_2 . Under the mild reaction conditions(80 °C, 4 h, CO_2 pressure 1 MPa), styrene carbonate was obtained in a yield of 42% without any organic solvent. In separate runs, it was found that Au/SiO_2 is active for the epoxidation of styrene, and ZnBr_2 and $n\text{-Bu}_4\text{N}^+\text{Br}^-$ cooperatively catalyze the subsequent CO_2 cycloaddition to epoxide. The styrene carbonate yield obtained in the present study is the highest among those reported, but it is not still satisfactory for practical application.

Key words [Styrene carbonate](#) [Styrene](#) [Styrene epoxide](#) [CO₂](#) [ZnBr₂/tetra-*n*-butylammonium halide](#) [Au/SiO₂](#)

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