ChemistrySelect

Research Article
doi.org/10.1002/slct.202201970

Chemistry Europe
European Chemical Societies Publishing

www.chemistryselect.org

CO_2 Cycloaddition to Styrene Oxide Catalysed by $ZnBr_2$ Impregnated Rice Husk Ash Silica: Structural and Kinetics Studies

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A series of $ZnBr_2$ impregnated on rice husk ash silica catalysts were synthesised via the wet impregnation method for the CO_2 cycloaddition to styrene oxide reaction. The X-ray diffraction (XRD) analysis indicates that the impregnation resulted in the deterioration of the silica's pore channels. Catalyst with 0.5 w/w % of Zn (0.5 wt%$ZnBr_2$-SiO_2) was highly active in the CO_2 cycloaddition to styrene oxide. The conversion of styrene oxide (StO) was 89.1%, with the styrene carbonate (SC) selectivity of 92.1% under the optimum conditions (130 °C, 60 bar, 3 h and solventless). Additionally, the universality of 0.5 wt%$ZnBr_2$-SiO_2 was also studied with other epoxides, and it shows good to excellent activity. The catalytic performance of the 0.5 wt% $ZnBr_2$-SiO_2 remains constant after being reused three consecutive times. The activation energy of the reaction was determined to be 89.06 kJ/mol.