289d Decomposition of Ethylene Carbonate during the Vacuum-Distillation with Residual Ionic Liquid-Based Zinc Tetrahalide Catalysts

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Ionic liquid-based zinc tetrahalide complexes have been found catalytically highly active for the coupling reactions of ethylene oxide (EO) and carbon dioxide to produce ethylene carbonate (EC) and successfully adopted in an environmentally benign continuous process using a jet-loop reactor. However, the zinc tetrahalide complexes were found to cause the decomposition of EC into EO and CO_2 during the vacuum-distillation of the product mixture. Various possible factors affecting the EC decomposition were evaluated, and the concentration of zinc tetrahalide species was found most responsible for the decomposition: the lower its concentration, the less the decomposition. The addition of imidazolium halide or ammonium halide was found effective for remarkably enhancing the activity of the zinc tetrahalide complex to produce EC while having only a negligible effect on the EC decomposition rate. Optimal catalyst composition and concentration have been discussed for producing high yields of EC with the minimized EC decomposition during separation and purification.