

Ionic Liquids and Green Process Engineering

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Ionic liquids (ILs) have attracted intensive attention in academia and industry due to their diversified properties and potential applications.^[1] The unique interactions have been proved to make ILs different from the conventional solvents and provide a unique environment for chemical process. Our researches showed that the total interaction is a result of a subtle balance electrostatic force, hydrogen bond, etc. The couple of forces results in a new interaction: Z-bond,^[1] which is named more scientifically based on the special features in molecular structure, interaction energy, electronic, dynamics and spectroscopic. Based on the fundamental research on Z-bond, some novel processes were developed.^[2] Firstly, we have overcome previous limitations to explore a novel process for the coproduction of ethylene glycol and dimethyl carbonate from ethylene oxide via ethylene carbonate, by using a kind of supported ionic liquid catalyst.^[3] Secondly, it was found Z-bond promoted the dissociation of proton from H₂SO₄.^[4] Trace amounts of ionic liquids were mixed in sulfuric acid to enhance the catalytic performance for the alkylation of isobutane with butene. The results indicate that the reaction efficiency was significantly improved, the lifetime of concentrated H₂SO₄ mixed with the ionic liquid was twice compared with pure H₂SO₄. Thirdly, Z-bond also plays important roles for the dissolution and conversion of biomass. The dissolution behavior of corn stalk by an ionic liquid in micro level was studied. Conversion of biomass into high octane number gasoline was also achieved. challenges are still great. Much systematic work on Ionic liquids should be carried out deeply and broadly.

Reference:

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