Acidic Room Temperature Ionic Liquids vs. Acidic Molten Salts – A Comparative Study in Cumene Isopropylation

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Electrophilic aromatic substitution reactions - especially Friedel-Crafts type reactions - are among the most important reactions for the preparation of alkylated arenes at industrial scale. The reaction is known to be catalysed by Lewis acids ($AlCl_3$, $FeCl_3$, $TiCl_4$ etc.) as well as by Brønsted acids like (HCl, H_2SO_4, H_3PO_4 etc.). A major problem in existing homogeneous Friedel-Crafts alkylation processes is the required hydrolysis of the catalyst phase at the end of reaction and thus a large amount of waste is produced. Due to this fact, developing a sustainable Friedel-Crafts alkylation process is of highly technical and environmental interest.

Since several years, our research group is dealing with the immobilisation of acidic catalysts in form of acidic ionic liquids that can be easily processed in form of liquid-liquid biphasic catalysis.[1] In recent times we have expanded our study also to low melting inorganic eutectics, such as e.g. $LiCl/AlCl_3$ or $Li[(CF_3SO_2)_2N]/AlCl_3$, that melt slightly above 100°C. These systems are interesting for practical reasons (cost aspects, thermal stability) but also for fundamental reasons as a comparison of the imidazolium based systems with the inorganic systems under identical conditions (e.g. at a reaction temperature of 150°C) allows to conclude on the effect of the organic cation for the biphasic catalysis.

Our poster presents such a comparison exemplified for the isopropylation of cumene. Based on detailed kinetic studies the influence of melt acidity and reaction temperature is discussed. Furthermore, the leaching of $AlCl_3$ into the organic product phase has been monitored for both the room temperature liquid and the inorganic chloroaluminate melt.

[1] a) P. Wasserscheid, M. Sesing, W. Korth, *Green Chem.* **2002**, *4*, 134; b) P. Wasserscheid, A. Metlen, N. Brausch, *Chem. Commun.* **2004**, 1552.