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Electrochemical behaviour of molten Imidazole with the strong acids

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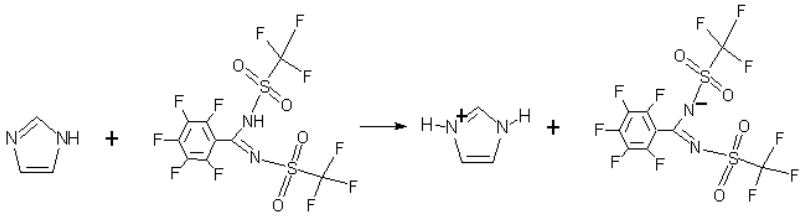
Ionic liquids (ILs) consist entirely of ions and have attracted considerable attention because of their unique properties such as nonflammability, negligible volatility, high ion conductivity, thermal and chemical stability, and so on.[1-5] With the aim towards innovating proton conducting ionic liquids for anhydrous proton conductors at elevated temperatures imidazole was selected to provide electrochemically insight into this kind of proton conduction.

The new superstrong acids, when mixed with imidazole as a Brønsted base, form an ionic liquid. Protonation of the base with the acids was found to promote the proton conductivity significantly:



Conductivity of imidazole (Im) – with addition of a strong acid (SA) has been measured at 120 °C as a function of the binary composition. Four new aryl super acids have been investigated, one shown in Figure 1. All the acids showed similar effects. By adding a few mol percent of these acids, conductivity of the melt is dramatically increased

On a smooth platinum electrode, the voltammetric current for the cathodic oxidation is also found to significantly increase as the concentration of the acids is increased from zero to about 5 mol%, indicating enhancement of the electrode kinetics. Further addition of the acid leads, however, to a decrease in the hight of the peaks. An explanation of these results are still under discussion.

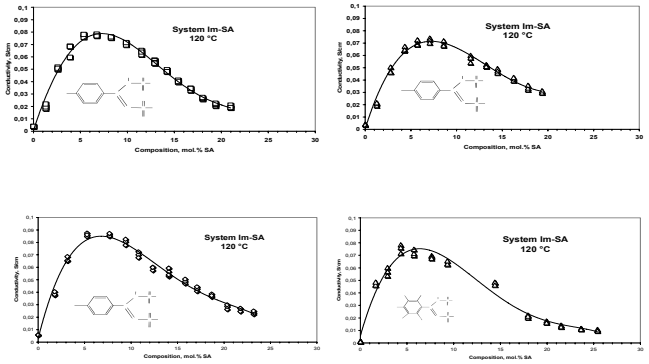


Figure 1. Dependence of the conductivity from composition for the molten system.

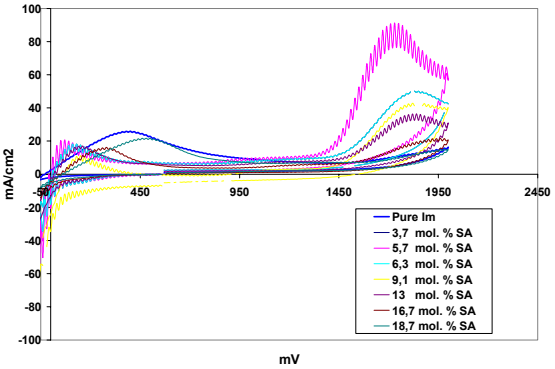


Fig.2. Cyclic voltammograms in the imidazole-fluoro-phenyl acid system at 120°C. Scan rate was 1000 mV/s. Concentration of the acid was indicated in the figure.

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