

## **Application of Imidazolium Based Room-Temperature Ionic Liquids as Solvents for Electrochemical and Spectroelectrochemical Studies**

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Room-temperature ionic liquids display a number of desirable physical and chemical properties, such as thermal stability, low vapor pressure, and good ionic conductivity. They are environmentally safe solvents and have several uses as catalysts and recyclable solvents in organic syntheses.

In this work 1-ethyl-3-methylimidazolium tetrafluoroborate (EMImBF<sub>4</sub>), 1-butyl-3-methylimidazolium hexafluoroborate (BMImPF<sub>6</sub>), and 1-butyl-3-methylimidazolium tetrafluoroborate (EMImBF<sub>4</sub>), have been synthesized and purified to be used as solvents in electrochemical and spectroelectrochemical studies of various inorganic complexes and ethanol. The pure ionic liquids give an electrochemical window in excess of 4.2V only when no traces of impurities such as H<sub>2</sub>O, NH<sub>4</sub><sup>+</sup>, Ag<sup>+</sup>, or Cl<sup>-</sup> are present in the liquids. These ionic liquids are excellent solvents for stabilizing transition metal complexes. The electrochemical and spectroelectrochemical properties of ferrocene, cobaltocene and various niobium and tantalum complexes, will be presented.

Possible application of ionic liquids in the ethanol based fuel cell was also investigated. Electrochemical oxidation of ethanol in EMImBF<sub>4</sub> was compared to the oxidation in H<sub>2</sub>O/HClO<sub>4</sub> solution.