

The Electrochemical Properties of the Ferrocenium/Ferrocene Redox Couple in Several Imidazolium Trifluoromethanesulfonate Ionic Liquids

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INTRODUCTION

The ferrocenium/ferrocene (Fc^+/Fc) couple has often been used as an internal standard for reporting electrode potentials due to the assumption that the couple remains constant, regardless of the nature of the solvent.¹ Although there have been a number of studies on the Fc^+/Fc couple in room-temperature ionic liquids (RTILs)², there has yet to be a comparative study on the effects of the cation. In this study, we measure the redox couple of Fc^+/Fc in several imidazolium triflates to determine the effects of C-2 Hydrogen substitution and the length of the alkyl chain on the electrochemical characteristics.

EXPERIMENTAL

The preparation of imidazolium RTILs have been described previously.³ Ferrocene was recrystallized from acetone solutions. Since the trialkylimidazolium triflates prepared have melting points above 50°C, the systems were measured at 60°C. The half-wave potential, redox couple, and diffusion coefficients were determined using both cyclic voltammetry and normal pulse voltammetry using platinum and glassy carbon working electrodes and a AgTf in 1-ethyl-3-methylimidazolium triflate (EMITf) reference electrode.

RESULTS AND DISCUSSION

The melting characteristics and densities of the trialkylimidazolium triflates have not been reported previously, and will be discussed in this study. The electrochemical stability and reversibility of the RTILs at elevated temperatures will be discussed and the electrochemical characteristics will be presented and compared to previous studies.

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The identification of any commercial product or trade name does not imply endorsement or recommendation by the United States Air Force (USAF). Opinions, interpretations, conclusions, and recommendations are those of the authors and are not necessarily endorsed by the USAF.

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