

A Reference Electrode for Room Temperature Ionic Liquids Electrochemical Studies

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Research in the area of ionic liquids electrochemistry is partly hampered due to the incapability of producing an accurate and reproducible potential measurement due to a lack of proper reference electrodes. Different approaches have been implemented to overcome this problem: in some cases Ag/Ag^+ or $\text{Ag}/\text{AgCl}/\text{Cl}^-$ with a relatively complicated manufacturing procedure are used. Another possible approach worth consideration is the use of "quasi reference" electrodes, mainly Pt or Ag. The potential measured with these electrodes is highly influenced by impurities in the IL itself or by various oxides at the metal surface. An alternative method to obtain a stable reference potential may be achieved by the use of different Red/Ox couples, mainly Ferrocene (Fc/Fc^+) and Cobaltocene (Cc^+/Cc) as internal standards. A drawback in this proposed system is noticeable when results obtained from different working electrodes are compared. This work describes a simple assembly of a stable external reference electrode. The electrode configuration is based on the Ferrocene (Fc/Fc^+) couple dissolved in EMIm(HF)_{2.3}F (1-ethyl-3-methyl-imidazolium oligofluorohydrogenate)/Carbopol 941 gel. A reversible Red/Ox reaction was measured in 5wt% and 2.5wt% gelling agent based solutions. A stable potential of 2.5wt% based electrode was measured vs. a Calomel reference electrode at $250\text{mV} \pm 3\text{mV}$. By utilizing the constructed electrode, the diffusion coefficient of Ferrocene (Fc/Fc^+) was measured under different conditions. The preliminary results of these gel-based reference electrodes are presented.