

Viscosity Measurements on Ionic Liquids: a Cautionary Tale

Joao Diogo¹, Fernando Caetano^{1,2}, Joao Fareleira^{C, 1} and William Wakeham^{S,1}

¹*Instituto Superior Tecnico, Universidade Tecnica de Lisboa, Centro de Quimica Estrutural, Lisbon, Portugal*

²*Universidade Aberta, Dept. Science and Technology, Lisbon, Portugal*

j.fareleira@ist.utl.pt

The vibrating-wire viscometer has proven to be an exceedingly effective means of determining the viscosity of liquids over a wide range of temperature and pressure. The instrument has a long history but a variety of technological and theoretical developments over a number of years have improved its precision and most recently have enable absolute measurements of high accuracy. However, the nature of the electrical measurements required for the technique has inhibited its widespread use for electrically conducting liquids so that there have been only a limited number of measurements. In the particular context of ionic liquids, which have themselves attracted considerable attention, this is unfortunate because it has meant that one primary measurement technique has seldom been employed for studies of their viscosity. In the last two years we have made systematic efforts to explore the applicability of the vibrating wire technique by examining a number of liquids of increasing electrical conductivity. These extensions have been successful. However, in the process we have had cause to review previous studies of the viscosity and density of the same liquids at moderate temperatures and pressures and significant evidence has been accumulated to cause concern about the application of a range of viscometric techniques to these particular fluids. Because the situation is reminiscent of that encountered for a new set of environmentally friendly refrigerants at the end of the last decade, we have reviewed in this paper the experimental methods employed with these liquids which leads to recommendations for the handling of these materials that may have consequences beyond viscometric measurements.