

High-Temperature Surface Tension Measurements of 1-Alkyl-3-Methylimidazolium Bistriflamide Ionic Liquids

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Most of the reported thermophysical properties for ionic liquids are restricted to the 293 K – 353 K interval, which is only a small part of the large liquid range of these substances. Keeping this in mind, we undertook a series of high-temperature surface tension measurements of 1-alkyl-3-methyl imidazolium bistriflamide, $[C_n\text{mim}][\text{NTf}_2]$, ionic liquids (with $n = 2, 3, 4, 5, 6, 8, 10, 12,$ and 14), which are commonly studied and known for their high thermal stability and large liquid range. The high temperature surface tensions were measured using the drop shape analysis (DSA) method with a built in thermostatic chamber having glass windows to acquire images with a high resolution digital camera. Two temperature sensors were placed as close as possible to the drop in opposite directions to exactly determine the precise temperature of the drop; care was also taken so that the sensors would not hinder the image acquired by the camera. This experimental set up allowed us to make surface tension determinations up to 533 K (which is quite close to the onset of decomposition of the studied ILs). The results demonstrate that the surface tension decreases fairly linearly as temperature increases. The results also demonstrate that even at high temperature these ionic liquids do not show any unusual temperature effect. Extrapolations to a null surface tension value using different commonly used equations^[1] enabled us to estimate hypothetical critical point temperatures and, from the obtained values, estimates of the (also hypothetical) normal boiling point temperatures.

[1] L. P. N. Rebelo, J. N. Canongia Lopes, J. M. S. S. Esperança, and E. Filipe, *J Phys Chem B* (2005) 109, 6040-6043.