

## Thermal Conductivity of [C<sub>2</sub>mim][dca], [C<sub>4</sub>mim][dca] and [C<sub>4</sub>mpyr][dca] and their Ionanofluids with Nanosystems

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The thermal conductivity of three ionic liquids, [C<sub>2</sub>mim][dca], [C<sub>4</sub>mim][dca] and [C<sub>4</sub>mpyr][dca], and their ionanofluids with carbon nanotubes, TiO<sub>2</sub> and Ag nanospheres have been measured between room 293 K and 343 K at 0,1 MPa. The instrument used (KD2 Pro Thermal Properties Analyzer Decagon, USA) is based on the transient hot-wire method, using an electrically insulated probe. The uncertainty of the thermal conductivity was estimated from the standard deviations of experimental and calibration measurements to be 6.6 % (k=2). A careful calibration was performed, using toluene, water, glycerol, one mixture of glycerol + water, and NaCl + water solution, in order to cover the range of thermal conductivities between 0.13 and 0.67 Wm<sup>-1</sup>K<sup>-1</sup>. An ionanofluid is defined as a mixture of an ionic liquid with a nanomaterial (in our case multi walled carbon nanotubes (MWCNT), TiO<sub>2</sub> and Ag nanospheres). In previous studies [1-3] we have showed that most of the desirable properties of ionic liquids are enhanced in ionanofluids, especially thermal conductivity and heat capacity. These properties are main technical requirements for liquid storage media and heat transfer fluids. The enhancement in the thermal conductivity is strongly dependent on the weight/volume fraction of the nanotubes/nanospheres present in the ionanofluid, with very weak temperature dependence. A discussion on the theoretical predictions for these enhancements is attempted, namely its dependence on the cation structure.

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[2] A. P. C. Ribeiro, S. I. C. Vieira, J. M. França, C. S. Queirós, E. Langa, M. J. V. Lourenço, S. M. S. Murshed, C. A. Nieto de Castro, “Thermal Properties of Ionic Liquids and Ionanofluids”, in *Ionic Liquids: Theory, Properties, New Approaches*, Edited by Prof. Alexander Kokorin, (2011) ISBN 978-953-307-349-1

[3] J.M.P. França, C.A. Nieto de Castro, S.M. Murshed, M.J.V. Lourenço, “Thermal Conductivity of Ionanofluids of [C<sub>4</sub>mim][NTF<sub>2</sub>] and [C<sub>2</sub>mim][EtSO<sub>4</sub>] and carbon nanotubes. Experiment, theory and heat transfer design”, *J. Chem. Eng. Data*, 2011 (to be submitted)