Summary

Preparation, stability, structure and physicochemical properties of ionic liquids with multiwalled carbon nanotubes.

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Ionanofluids are dispersions consisting of an ionic liquid and nanoparticles suspended in it. It is a very broad class of substances, so in my work I have focused on a selected group of these systems which are ionic nanofluids with carbon nanoparticles, specifically multiwalled carbon nanotubes in-house 16h MWCNTs (MWCNTs -multiwalled carbon nanotubes). I have prepared nanofluids based on nine ionic liquids in a concentration range of MWCNTs from 0.25wt% to 5wt% The ionic liquids were chosen to allow for investigation of the influence of the cation as well as the anion structure on the properties of the obtained systems.

The aim of my dissertation is to describe the internal structure of ionanofluids and the mechanisms of stabilisation of carbon nanotubes in ionic liquids and the mechanisms of heat transfer in ionanofluids. These mechanisms are described taking into account factors such as: the structure and morphology of carbon nanotubes, the structure of the ionic liquid, the interactions between the base liquid and the suspended carbon nanotubes, and the effect of temperature on the physicochemical properties of the studied systems.

During my research, I developed a new, reproducible method of obtaining ionanofluids that are stable long-term. The ionanofluids based on [BMPyr][NTf2] with concentrations of 0.50wt%, 0.75wt%. and 1.0wt% in-house 16h MWCNTs have a documented sedimentation stability of 4 years. Physicochemical properties of the ionic nanofluids were measured, i.e. density, viscosity, thermal and sedimentation stability, specific isobaric heat capacity. TEM and cryo-TEM micrographs of the studied systems, as well as their cytotoxicity, were also performed in collaboration with other scientific entities. Chosen measurements made it possible to realise the set objective of the work, i.e. to describe the structure of ionic nanofluids and to describe the mechanisms that explain their physicochemical properties.

The research was also set in the context of the application of ionanofluids with multiwalled carbon nanotubes as a potential heat transfer fluids, especially in solar systems.