

Surface Tension of Supercooled Aqueous Mixtures: Preliminary Data for Mixtures with Alcohols and Sodium Chloride and for Seawater

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Our team has recently published a series of data for the surface tension of pure water under the metastable supercooled conditions, i.e. at temperatures under the equilibrium freezing temperature. Primarily, a modified capillary rise technique [1,2] was successfully used for the measurements down to -26 °C. Unlike previous measurements by P.T. Hacker [3], the new data did not show any anomaly and could be well reproduced by the IAPWS standard for the surface tension of ordinary water [4] extrapolated below 0.01 °C. Recently, a new measuring technique similar to that employed by Hacker, using the horizontal capillary tube, was developed by our team [5]. The data obtained with the horizontal capillary tube showed good agreement with the capillary rise measurements [6] and did not prove potential anomaly in the surface tension of supercooled water down to -23 °C. In the current work, the experimental apparatus was further modified such that it allows for measurement of aqueous mixtures under the supercooled state. The apparatus is based on the original capillary rise technique, however with several modifications. New data for the surface tension of aqueous mixtures with methanol, ethanol, and propanol, and with sodium chloride measured at various concentrations together with data for seawater are shown. Preliminary data seems quite promising and show good internal consistency.

References:

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