Effect of inclusion complex between β-cyclodextrin and 1-butyl-3-methylimidazolium hexafluorophosphate on anomalous behavior of water between 40 and 60 °C

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Abstract: Water has been known to exhibit anomalous behavior between 40 and 60 °C in both pure form and in mixtures. The exact temperature at which water displays unusual characteristics has yet to be determined and has been found to vary in presence of additives. The inclusion complex of cyclic oligosaccharide β-cyclodextrin and a room-temperature ionic liquid, 1-butyl-3-imidazolium hexafluorophosphate was used as an additive in very low concentrations to study its effect on water with respect to temperature. Particle size analysis revealed that the complex was more resistant to the effect of the anomalous behavior of water, breaking down into smaller species above 50 °C, whereas previously studied additives were affected below 50 °C. Near-infrared spectroscopy revealed the concentration too low to detect any bands of the complex separately, which allowed the investigation of the effect of the combination bands of the OH vibrations of water in presence of the complex without significant interference of the vibrations of the complex itself. Further studies on mathematical and statistical analyses of the spectral data as well as the comparison of the spectral changes in difference temperature regions will be presented.

Keywords: [C₄mim]PF₆; β-cyclodextrin; DLS; NIR; Water