

Abstract template:

Title

Ions and Hydrogen Bonding in a Hydrophobic Environment: CCl₄

Reference

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Authors

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Abstract

It is generally expected that ions in an aqueous ionic solution in contact with a hydrophobic phase enter the hydrophobic phase accompanied by a hydration shell. This expectation suggests that the ion mole fraction in the hydrophobic phase is less than, or at most, equal to that of water. Both gravimetric and spectroscopic evidence shows that for a model hydrophobic phase, carbon tetrachloride, this is not the case: In contact with a 1 *M* simple salt solution (sodium or potassium halide) the salt concentration in carbon tetrachloride ranges from 1.4 to nearly 3 times that of water. Infrared spectra of the OH stretch region support a model in which water associates with the cation, primarily as water monomers. Salts containing larger, more polarizable anions can form outer-sphere ion pairs that support water dimers, giving rise to a spectral signature at 3440 cm⁻¹. In CCl₄, the infrared spectral signature of the normally strongly ionized acid HCl clearly shows the presence of molecular HCl. Additionally, the presence of a *Q* branch for HCl indicates restricted rotational motion. The spectral and gravimetric data provide compelling evidence for ion clusters in the hydrophobic phase, a result that may have implications for hydrophobic matter in both biological and environmental systems.