The Induced Interfacial Hydration: Model Experiments Concerning Water Structure Near Biological Interfaces

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Water plays an important role in a vast number of biological processes in living tissue. Biological systems are rich in interfaces and these exert a marked influence on adjacent water structure (induced interfacial hydration).

It has proved usefull to attack the problem of water structure in biological systems by performing model experiments. A direct measure of the change of water structure near interfaces is the structural disjoining pressure arising between two solid surfaces - one plate is planar, the other is spherically formed - placed in an aqueous system when very small distances of the order of about 5 nm and less are adjusted. Along with these results the average thickness of the hydration sheat located at an interface can be determined. The mean thickness of hydration layers on a surface amounts to 3 - 4 molecular layers.

Furthermore, there are additional hydration effects depending on the structure and the solution which can be induced in definite concentration ranges of aqueous solutions. The particular hydration behavior of aqueous NaCl and KCl solutions near interfaces is of biological importance. At some distinct temperatures maxima in the surface hydration strength arise which can be well correlated with quite a lot of temperature anomalies in the temperature dependence of biological processes. These effects are recently supported by calorimetric measurements. The induced hydration phenomena can also be demonstrated by means of Langmuir-balance and the adsorption of organic compounds from aqueous solutions onto charcoal.