The Surface Tension of Pure-Water in its Pure-Vapour

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Very little is known about the surface tension of pure liquids in contact with their pure gaseous phases, i.e. without the presence of other gases or contaminants. This is surprising given that contaminants and gas phase species are known to greatly affect surface tensions values[1]. For example, much controversy remains around the nature of the Jones-Ray effect[2,3,4], the anomalous behaviour of salt solution surface tensions and whether this phenomenon is due to contaminants or an as yet unknown fundamental property of water.

Recently we have developed a method to dose liquid water onto pristine surfaces in UHV using a small cryostat[5]. We combine this method with pendant drop tensiometry[6] to measure the surface tension of pure-water drops in contact with their pure gaseous phase, removing completely the effect of other gases and contaminants. In the design, the pure-water is condensed onto a small cryostat placed in a vacuum chamber. A pendant drop is formed and carefully photographed allowing the surface tension of the pure-water to be directly determined.

For these types of measurements accurate knowledge and control of the temperature, pressure and the optics of system is of paramount importance and defines the error of the measurement. How these parameters are precisely controlled in the instrument design will be discussed along with initial measurements of pure-water.

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