

## Polysaccharide solutions and gels: isothermal dehydration study by DSC

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**Purpose:** To investigate the state of water and its physical changes in polysaccharide solutions and gels during isothermal dehydration, by means of a novel microcalorimetric set-up.

**Methods:** A new application of the DSC technique has been recently developed in order to provide information about the thermodynamics and the kinetics of water evaporation in isothermal conditions. Under quasi-thermodynamic conditions and fixed boundary terms, the apparent water activity is determined during dehydration, namely as a function of the water fraction of the sample.

**Results:** The experimental parameters controlling the dehydration in isothermal condition have been investigated. A calibration curve with CaCl<sub>2</sub> has been used to evaluate the proportionality between the DSC signal and the corresponding water activity. The set-up has been optimized in order to be extended to complex systems. Thus, the technique allows to distinguish the dehydration behavior of samples of aqueous solutions and gels (sugars and polysaccharides), on the basis of their capability of binding water. A good correlation has been achieved between conventional hygrometric measurements and calorimetric ones for different kind of systems within the experimental error.

Along the main outcomes is the possibility to obtain complete desorption isotherms (on the basis of the initial water amount) and to extend the technique to a wide range of substrates such as vegetable thin tissues and cells monolayer.

**Conclusions:** The actual value of this novel experimental approach is the determination of the “apparent” water activity values for a wide range of systems over the full range of water content and within a short experimental time-window (from minutes to few hours). This supports the possible application of the calorimetric method for routine determinations.

### References

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