THE EFFECT OF CARBOHYDRATE DISACCHARIDE MOLECULES ON THE RAMAN SPECTRA OF H_2O AND D_2O

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Abstract: The effects of the disaccharides maltose, sucrose and trehalose on the Raman spectra of H_2O and D_2O have been examined.

Trehalose (α-D-glucopyranosyl-α-D-glucopyranoside; Fig. 1) is a non-reducing disaccharide which is widespread in nature. It is used as an "active stabilizer" [1] of e.g. proteins and pharmaceutical preparations. In fact it has been suggested that the protein stabilization properties of trehalose might be made use of in preventing protein aggregation in amyloid disorders [2]. Moreover trehalose is recognized as a crucial defense mechanism in a variety of organisms for *in vivo* stabilization of proteins and biological membranes under a variety of stress conditions including increased temperature, hydrostatic pressure, desiccation, nutrient starvation, osmotic or oxidative stress and exposure to toxic chemicals [3]. The mechanisms of bioprotection by the disaccharides maltose, sucrose and trehalose are not well understood. However, the mechanism may well derive (at least in part) from the unique physico-chemical properties of water.

In the studies reported herein the effects of the disaccharides maltose, sucrose and trehalose on the Raman spectra of H_2O and D_2O have been examined using a laser exciting wavelength equal to 632.8 nm.

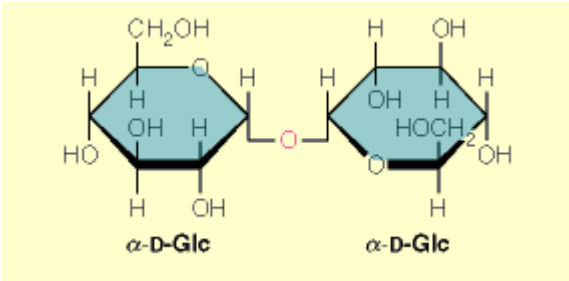

Fig. 1. Schematic chemical structure of trehalose.

The effects of different concentrations of trehalose on the Raman spectrum of D_2O in the 2000-3000 cm^{-1} region are shown in Fig. 2.

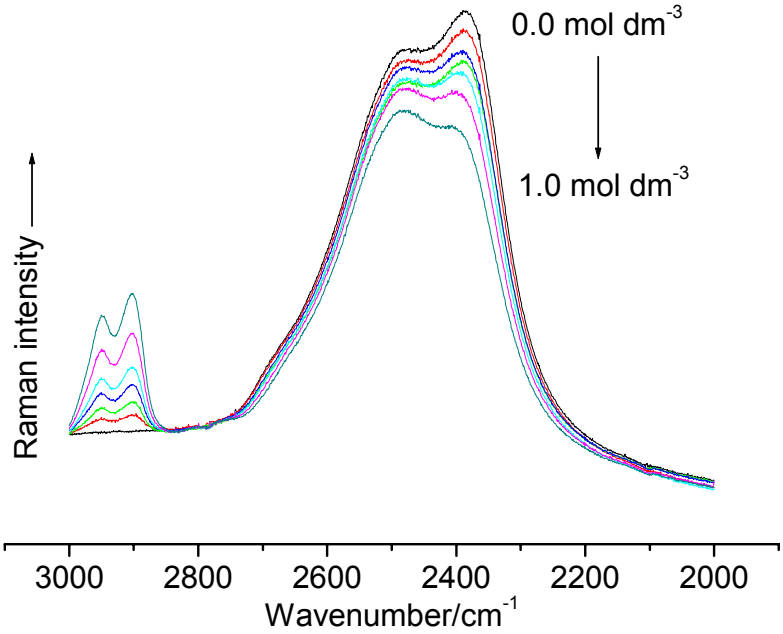

Fig. 2. Raman spectra of D_2O in the presence of different concentrations (0-1 mol dm^{-3}) of trehalose. All spectra were obtained at room temperature.

The presentation will discuss the details relating to a comparison of the vibrational spectra of the different disaccharides solubilized in H_2O and D_2O.

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