

Abstract Submitted
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Retardation of Hydration Dynamics in the Bulk by Disaccharide Osmolytes NIMESH SHUKLA, Wesleyan University, ENRICO POMARICO, MAJED CHERGUI, Ecole Polytechnique Federale de Lausanne, CHRISTINA OTHON, Wesleyan University — The bioprotective nature of disaccharides is hypothesized to come from the modification of the hydrogen bonding network of water which protects biomolecules through lowered water activity at the protein interface. Using ultrafast fluorescence spectroscopy we measured the relaxation of bulk water dynamics around the induced dipole moment of two fluorescent probes (Lucifer yellow ethylenediamine and Tryptophan). Our results indicate a reduction in bulk water reorganization rate of approximately of 30 -70%. We report this retardation to be present in the low concentration regime measured at 0.1M and 0.25 M, far below the onset of glassy dynamics. This reduction in water activity could be significant in crowded biological systems, contributing to global change in protein energy landscape, significantly enhancing the stability of proteins under thermal stress. We observed similar dynamic reduction for two disaccharide osmolytes, sucrose and trehalose, with trehalose being the more effective dynamic reducer.

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