

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

X-ray studies of crystal transformation in dehydrating trehalose¹

DUNCAN KILBURN, PAUL SOKOL, Indiana University — The disaccharide trehalose is known to assist in stabilizing dehydrated biological cellular structure. It is present in relatively large quantities in certain organisms whose bodies remain viable for significant periods of time under conditions of extreme drought. Whilst trehalose may not be unique among the sugars in this function, there have been several studies investigating the influence of water on trehalose structure in the hope of determining the mechanism responsible for the properties noted above. We report real-time wide angle X-ray diffraction studies as the commonly occurring crystalline dihydrate form of trehalose is dehydrated at a range of temperatures (in the range 40-70 C) and forms the ‘alpha’ crystalline form of anhydrous trehalose. We find that there is evidence of a two-step process: the dehydration, followed by a crystalline-crystalline transition. The speed of the latter transition is surprising because the dehydrated amorphous form of trehalose has a glass transition temperature of roughly 120 C.

¹This work is supported by the National Science Foundation.

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Date submitted: 27 Nov 2007

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