Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Structural effect of sugars on water[1] SIMCHA SREBNIK, RAVIT MATZA, ILIYA KUSNER, YOAV D. LIVNEY[2], Technion - Israel Institute of Technology — The modulation of the structure of liquid water by solutes has tremendous consequences in numerous fields, particularly on the stability of proteins. However, the reasons for the differences in effects of similar solutes are still unclear. Recently, Livney and coworkers [1] found a strong relationship between the hydration layer of sugars and its effect on the phase transition of a model polymer, which may be explained by the strong interaction between water and sugars leading either to cooperative structuring of the water and thus to large hydration numbers, or disrupting water structure near the sugar, resulting in lower hydration. Using atomistic Monte Carlo simulation, we studied the compatibility of various sugars with an ideal tetrahedral water structure, as embodied in hexagonal ice. Our simulations suggest the following order of compatibility with ideal water structure: galactose > glucose > mannose. In agreement, experimental measurements of isentropic compressibility show the same order of hydration numbers and kosmotropic effect. A simple physical model of the binary system is used to shed further insight on the structuring effect of sugars on water. 1. Shpigelman, A.; Portnaya, I.; Ramon, O.; Livney, Y. D. J Polym Sci Part B: Polym Phys 2008, 46, 2307-2318.

[1]Israel Science Foundation is acknowledged for partial support.
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Date submitted: 26 Nov 2008 Electronic form version 1.4