Experimental report

14/02/2017

Proposal: 9-13-639 **Council:** 4/2016

Title: Dynamics study of freeze-destabilization of proteins in carbohydrate-sugar systems

Research area: Physics

This proposal is a new proposal

Main proposer: Viviana CRISTIGLIO

Experimental team:

Local contacts: Tilo SEYDEL
Viviana CRISTIGLIO

Samples: d-sorbitol(h-sorbitol/d-glucose) -D2O
d-sorbitol(h-sorbitol/d-glucose) - D2O - lysozyme
D2O - lysozyme

Instrument	Requested days	Allocated days	From	To
IN16B	4	4	19/09/2016	23/09/2016
D16	7	3	02/09/2016	05/09/2016

Abstract:

Sugars and other polyhydroxycompounds are well-known cryo- and lyo-protectors which minimize destabilization of proteins and other biological systems during the freeze-drying process. However, freeze-destabilization of proteins is commonly observed even in presence of sugars. Details of such destabilizing effect of ice water interfaces should be elucidated.In our previous study we studied the influence of sorbitol as a cryo-protector by in situ small angle neutron scattering to detect protein crowding, phase separation and large-scale heterogeneity in frozen solution model systems. Our findings suggest that sorbitol protects the protein from irreversible aggregates by reducing the protein crowding in the amorphous phase. Static methods alone are not sufficient to unambiguously infer on the presence of dynamic or transient protein clusters. Therefore, the current proposal is aimed to extend these studies using the neutron backscattering spectroscopy to follow the protein diffusion on the nanosecond time scale in carbohydrate-sugar systems. These data will give new insights in the protein crowding behaviors during crystallization improving the interpretation of the previous data.

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