

## Concentration fluctuations of DMSO-water mixtures

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Amyloid fibril formation is now recognized as a phenomenon common to many proteins and peptides. Amyloid fibrils are associated with fatal diseases such as Alzheimer's, which is caused by misfolding of proteins. Thus, it is important to investigate the underlying mechanism of Amyloid formation for understanding the properties of Amyloid fibrils and preventing the formation of the fibrils. It was reported that fluoroalcohols and dimethylsulfoxide (DMSO) completely dissolved  $\alpha$ -microglobulin amyloid fibrils although a high concentration [i.e., 80%(v/v)] was required for DMSO [1]. The dissolution mechanism is not known, however. It is very likely that the dissolution of amyloid fibril is related to solvent environment in these mixtures. The small-angle neutron scattering (SANS) in dimethylsulfoxide (DMSO)-D<sub>2</sub>O mixtures of DMSO mole fractions (0.3, 0.4, 0.5, 0.6, 0.8) was measured at 298 K. A sample was kept in a quartz cell of 1-mm or 2-mm path length. The distance between the sample and detector was 2 m, corresponding to  $Q$  of 0.02 - 0.14  $\text{\AA}^{-1}$ . Measurements were also made for background, an empty cell, and lupolen used for intensity normalization. For the SANS data, the Ornstein-Zernike plots were made according to  $I(Q)^{-1} = I(0)^{-1} (1 + \zeta^2 Q^2)$  where  $\zeta$  is the Ornstein-Zernike (OZ) correlation length, and  $I(0)$  is the intensity at  $Q = 0 \text{ \AA}^{-1}$ . The maximum in the correlation length  $\zeta$  obtained from the analysis of SANS data was found at  $x_{\text{DMSO}} \simeq 0.5$ . As the correlation length  $\zeta$  is a measure of concentration fluctuation, the SANS data also indicate the structural transition of solvent cluster at this solvent composition. These results are in good agreement with those obtained from X-ray diffraction [2].

[1] N.Hirota-Nakaoka, et al., *J. Biochem.*, **134**,159 (2003). [2] K. Ueki, "Structure of DMSO-Water Mixtures and Synthesis of Amyloid-like Fibrogenic Peptide" Diploma thesis of Fukuoka University, March, 2006.

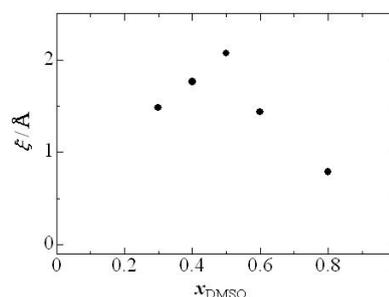


Fig. 1. The OZ correlation length as a function of DMSO mole fraction for DMSO-D<sub>2</sub>O mixtures at 298 K.