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Dynamics of denatured and native bovine serum albumin: A neutron spectroscopy study

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A characteristic property of unfolded and disordered proteins is their high molecular flexibility, which enables the exploration of a large conformational space. We present neutron scattering experiments on the dynamics of denatured and native folded bovine serum albumin (BSA) in solution over the full time-range that is accessible via neutron spectroscopy (1,2). In a first set of experiments protein dynamics of unfolded and folded BSA were investigated on the ps to ns time-scale using neutron time-of-flight and backscattering spectroscopy (1). A significant dynamical heterogeneity in the native folded protein was observed. Chemical denaturation has a drastic effect on the ps to ns motions of the protein. Anomalous diffusion in denatured BSA was found to show essentially characteristic properties of heterogeneous dynamics, caused by a distribution of exponential diffusive processes. Using neutron spin-echo (NSE) experiments, we observed a high internal flexibility of denatured BSA (2). Internal motions measured by NSE were described using concepts based on polymer theory. The contribution of residue-solvent friction was accounted for using the Zimm model including internal friction. Disulphide bonds forming loops of amino acids of the peptide backbone have a major impact on internal dynamics of denatured BSA that can be interpreted with a reduced set of Zimm modes

1. Ameseder et al. Phys Chem Chem Phys, 20, 5128-5139
2. Ameseder et al. J. Phys. Chem. Lett, 9, 2469–2473

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