MAR13-2012-020064

Abstract for an Invited Paper
for the MAR13 Meeting of
the American Physical Society

A colloidal perspective of protein solutions manipulated by multivalent ions: Phase behavior and associated dynamics

FRANK SCHREIBER, Tuebingen University

After a brief overview of interactions in aqueous protein solutions, we will discuss how ions can be used to manipulate these interactions and the associated phase behavior as well as the diffusion dynamics. We show that multivalent ions do not only influence the ionic strength and the resulting interactions including effective attraction, but lead to qualitatively new effects. Particular attention will be given to the reentrant condensation of proteins (F. Zhang et al, PRL 101 (2008) 148101; F. Zhang et al, Soft Matter 8 (2012) 1313) and its relationship with liquid-liquid phase separation and protein crystallization. In particular, we attempt to rationalize crystallization controlled by trivalent ions and discuss the role of specific ions and their impact on the effective interaction potential. These results are compared to the diffusion dynamics in these systems studied using neutron spectroscopy and light scattering (F. Roosen-Runge et al, PNAS 108 (2011) 11815; Heinen et al, Soft Matter 8 (2012) 1404) and the question of transient clusters is discussed. Finally, we critically discuss to which extent proteins can be described by colloidal concepts. The work was performed in collaboration with F. Zhang, T. Seydel, M. Hennig, F. Roosen-Runge, M. Skoda, R. Jacobs and others.