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Investigations on the kinetics of the Liquid-Liquid Phase Separation of the Myelin Basic Protein

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Liquid-liquid phase separation (LLPS) of intrinsically disordered proteins has attracted a wide attention in the biological and biophysical community, and it is considered as a 'hot'topic. We investigated the kinetics of the LLPS of the myelin basic protein (MBP) over several orders of magnitude in time.

MBP is essential for the integrity of myelin sheaths ensuring flawless neuronal signal propagation. MBP is intrinsically disordered and under appropriate solvent conditions, it is able to perform a so-called Liquid-Liquid Phase separation (LLPS). Dense liquid-like MBP phases being in contact with biomimetic membranes have been observed by neutron reflectometry. Hence, it is assumed that LLPS is necessary for physiological function of MBP. Despite intensive research, the nucleation and droplet growth of intrinsically disordered proteins such as MBP during the LLPS are not yet understood. Hence, we want to provide important information about LLPS kinetics. In our experiments, crowding by polyethylene glycol (PEG) induces the LLPS of MBP. TR-SAS allowed us to follow the evolution of nucleating droplets from ~ 0.1 sec to 3 min, while the long-time behaviour of µm-sized droplets was monitored by DLS giving indications for Ostwald ripening as Rh ~ t^1/3.

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