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The Phase Behaviour of the Myelin Basic Protein

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The Myelin Basic Protein (MBP) is an essential part of the myelin sheath in almost all vertebrates and, thus, contributes significantly to flawless signal conduction. Here, one of its key properties is the ability to perform a Liquid-Liquid Phase Separation (LLPS), the coexistence of highly concentrated protein phases within a diluted solution.

Microscopy experiments have indicated that a LLPS of MBP would occur upon the addition of Polyethylene glycol (PEG). By using contrast matched PEG in 100% D₂O, USANS experiments (KWS-3 at MLZ) confirmed that the optically observed droplets originated from MBP condensates. The droplet size was determined to be in the low μm range, which is in good accordance with DLS measurements. Kinetic studies on the droplet growth pointed out that an equilibrium size was reached after only a few minutes. Furthermore, the investigations have shown that both coalescence and Ostwald ripening contribute to droplet expansion.

Neutron scattering experiments at KWS-2 revealed unfolding of the proteins as well as increasing size of MBP molecules upon the addition of PEG. As a complementary technique, CD spectroscopy was used which supported the previous finding.

It is concluded that variations of protein structure and the occurrence of a LLPS are related phenomena which affect each other. Hence, future examinations will cover this effect in more detail, as well as droplet growth kinetics of the earliest stages of a LLPS with improved temporal resolution.

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