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**The Kinetics and Mechanisms of Pressure-jump Induced Phase Transitions in Lyotropic Lipid Systems.**

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The kinetic and structural aspects of lamellar to inverse bicontinuous cubic phase transitions have been investigated in various lipid systems, such as monoolein (MO). Transitions in both the forward and reverse directions were achieved by means of fast pressure-jumps and the subsequent structures monitored using time-resolved X-ray diffraction. The data obtained are analyzed with reference to established models, such as for biological cell fusion. Lamellar to non-lamellar lipid phase transitions are primarily determined by the bilayer physical properties, but also by protein-lipid interactions. Hence, we also studied the effect of protein incorporation into the nanochannel structures of MO on the structure and phase transition kinetics of the system. Hydrostatic pressure has been used as a physical parameter for studying the dynamics of lyotropic lipid mesophase transformations and for the fundamental understanding of protein-membrane interactions in intracellular events, but also because high pressure is an important feature of certain natural membrane environments and because the high pressure phase behavior of biomolecules is of biotechnological interest, such as for baroenzymology.