

FORMULATION OPPORTUNITIES DUE TO GELLING AND JAMMING IN COLLOIDAL MULTIPHASE SYSTEMS

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Colloidal particles can mediate a kinetic arrest of the thermodynamically favored phase separation between immiscible fluids, and the resulting arrested multiphase structures can play a central role in addressing formulation challenges. The kinetic arrest often proceeds via jamming of particles adsorbed at a fluid interface, and sometimes via the formation of a gel network, with different implications for the system's mechanics and transport properties. Gelling and jamming appear to occur in parallel when an aqueous solution and a small amount of oil are combined and frothed in the presence of particles with somewhat similar wettability for both liquids. The resulting structure is that of the recently discovered "capillary foams": water-continuous four-phase systems, in which gas bubbles are coated by a particle-stabilized layer of oil and embedded in a network of oil-bridged particles. I will discuss material properties and formulation opportunities afforded by the complex multi-phase architecture of these new foams.