

Self-assembled Structures of Dendrimer-Surfactant Complexes: Perforated Layer and Undulated Lamellae

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Self-assembly of supramolecules is a powerful approach to develop functional materials with well-defined structures. In polymer-amphiphile complex systems, self-assembly is based on the segregation of the incompatible segments into distinct subspaces. In this study, we reveal that the complexation of poly(amidoamine) G6 dendrimer with dodecylbenzenesulfonic acid via acid-base interaction led to the formation of a perforated layer structure in which the perforations packed in cubic or tetragonal lattice at the intermediate binding fraction of the surfactant to the dendrimer. The perforated layers composed of the dendrimer and surfactant molecules displayed high degree of undulation due to the intrinsic molecular curvature of dendrimer. As the binding fraction approached the stoichiometric value, the enhanced hydrophobic interaction of the alkyl tails transformed the structure into an undulated lamellar structure with the in-plane undulation exhibiting a well-defined wavelength. The stacking of the undulation along the lamellar normal however lacked long-range order. The change of the interfacial curvature was a consequence of the delicate balance between dendrimers trying to maintain their isotropic curvature and alkyl tails tending to arrange into their preferential orders with low packing frustration.

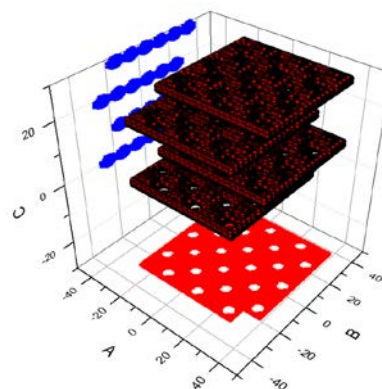


Figure 1 Perforated layers with tetragonal lattice packing of perforations.

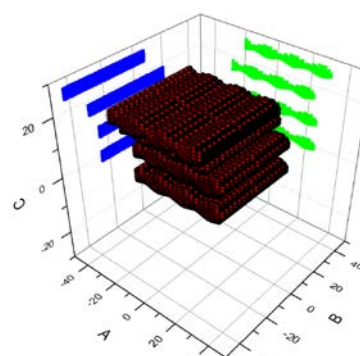


Figure 2 undulated lamellar structure

Keywords: PAMAM dendrimer, DBSA surfactant, complex, perforated layer structure, undulated lamellar structure