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Structural Phase Diagram for Multi-lamellar Tubular Deformations of Lipid Mesophases LOBAT TAYEBI, ATUL PARIKH, University of California, Davis — Stable multi-lamellar cylindrical tubules protrude readily from concentrated mass of amphiphilic molecules in response to a variety of external stresses. Using energetic considerations, we have developed an phase diagram, predicting various types of morphologies of equilibrium multilamellar tubular deformations that stabilize for a broad range of their bending rigidity and surface tension values. Tubular morphologies are described in terms of core radius(rc) and number of lamellae(N). Results of the calculations reveal that emergent tubular morphologies can be classified into three major classes: (1) thin tethers (small rc and low N); (2) solid tubes (high N); and (3) hollow tubes (large rc and and low N). Experimental validation of these predictions is obtained in experiments involving hydration of dry stack lipids Here, tubular deformations, referred to as myelin figures, of all predicted morphologies form in separate populations. Furthermore, the phase diagram also sheds light on a long-standing question of the determinants of the thickness of such myelin figures.

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