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Layer Dynamics in Free Standing Membranes of Smectic Liquid Crystals[1] SHOKIR PARDAEV, ZEINAB PARSOUZI, ALAN BALDWIN, JAMES GLEESON, Department of Physics, Kent State University, ANTAL JAKLI, CPIP and Liquid Crystal Institute, Kent State University, SAMUEL SPRUNT, Department of Physics, Kent State University — We studied the layer dynamics of free-standing smectic liquid crystal membranes with particular focus on the surface parameters that control these dynamics. Photon correlation spectroscopy reveals the contribution of distinct under- and overdamped processes. The frequency and damping rate of the former scale with scattering wavenumber in a manner that can be explained by the effect of a surface elastic constant (associated with gradients in surface tension) in addition to the average surface tension. The damping is shown to be quite sensitive to the presence of an atmosphere surrounding the film. The dispersion of the overdamped mode, observed in sufficiently thick films, can be explained as a composite of a surface elastic mode (hydrodynamic mode) and surface molecular tilt (non-hydrodynamic mode).

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