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Optical Activity in Deformed Plastic Shells[1] M. WORSTELL, R.B. STEPHENS, General Atomics — Inertial confinement fusion targets must be accurately spherical for proper compression and good performance. They are made by vapor deposition onto decomposable mandrels. These mandrel surfaces are occasionally rippled with a ripple wavelength ∼1/10 the shell circumference (∼600 μm wavelength), and a ripple amplitude ∼1 μm. Such ripples would degrade the performance of targets, but their low amplitude makes them very difficult to detect and select against. Turbulence in the polymer solution during curing of the mandrels (related to the Marangoni effect) has been postulated as the source of the ripples, but it has been difficult to understand the physics which connects the two. We found an optical activity associated with the surface ripples. This activity is typically caused by alignment of polymers during shear (i.e., photoelasticity). Such alignment would cause anisotropic shrinkage of the shell during the curing stage, and would lead to surface ripples. We will show the connection between optical activity and ripples, and discuss the mechanisms of this connection in detail. As a side benefit, the optical activity which we observed allows us to easily cull samples exhibiting such defects.

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