Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Surface topography and rotational symmetry breaking RAJRATAN BASU, The US Naval Academy, IAN NEMITZ, Case Western Reserve University, QINGXIANG SONG, ROBERT LEMIEUX, Queen's University, CHARLES ROSENBLATT, Case Western Reserve University — The surface electroclinic effect, which is a rotation of the molecular director in the substrate plane proportional to an electric field applied normal to the substrate, requires both a chiral environment and C_2 (or lower) rotational symmetry about the field. The two symmetries typically are created in tandem by manipulating the surface topography, a process that conflates their effects. Here we use a pair of rubbed polymer-coated substrates in a twist geometry to obtain our main result, viz., that the strengths of two symmetries, in this case the rub-induced breaking of C_∞ rotational symmetry and chiral symmetry, can be separated and quantified. Experimentally we observe that the strength of the reduced rotational symmetry arising from the rub-induced scratches, which is proportional to the electroclinic response, scales linearly with the induced topographical rms roughness and increases with increasing rubbing strength of the polymer. Our results also suggest that the azimuthal anchoring strength coefficient is relatively insensitive to the strength of the rubbing.

Rajratan Basu
The US Naval Academy

Date submitted: 09 Nov 2012 Electronic form version 1.4