

**THE PHASE STABILITY AND OPTICAL PROPERTIES OF A POLYMER-
STABILIZED ANTI-FERROELECTRIC LIQUID CRYSTAL**

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ABSTRACT

Optical Bragg reflection and optical activity experiments were completed in order to examine the phase stability and optical properties of a polymer network created within the chiral smectic-C (SmC^*) phase of the antiferroelectric liquid-crystal AS661. A photo-chemical process was used during polymerization to ensure that the networks were completed while the material was in its SmC^* phase. Results taken after the polymerization process are compared to those of the pure material, as well as results of the same material taken before polymerization.

The most significant changes to the phase stability of AS661 were seen in the temperature range of the (SmA & SmC^*_{α}) phases and the SmC^*_A phase. Optical activity measurements clearly showed an increase in the (SmA & SmC^*_{α}) phases at the expense of the SmC^*_A phase for increased dopant concentration. Doped samples also showed an increase in the SmC^*_{F11} and SmC^*_{F12} phases as well as a decrease in the SmC^* phase over that of the pure material. These changes were

more extensive for pre-polymerized materials compared with samples after polymerization.

The Bragg wavelengths of the SmC* phase were reduced for increased dopant concentration. This was observed for materials before, and to a lesser degree, after the polymerization process. Theoretical fittings to these wavelengths indicated a likely decrease in the ratio of (κ_3/n) , suggesting a decrease in the torsional elastic constant (κ_3) and/or an increase in the materials refractive index (n).

Keywords: Bragg scattering; Anti-ferroelectric liquid crystal; polymer stabilization; optical activity.