

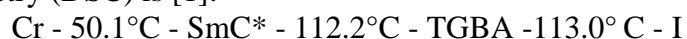
Behaviours of a photosensitive liquid crystal in the SmC* ferroelectric phase

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In this work, we report the temperature dependencies of the electro-optical behaviours of a pure photo-ferroelectric liquid crystal, in the SmC* phase, with and without UV illumination. The studied chiral photosensitive liquid crystal phase sequence, obtained in the dark state, by differential scanning calorimetry (DSC) is [1]:



Phase transitions of this compound can be either induced by heating or by illuminating the sample [2]. It's well known that upon UV light absorption, the energetically more stable trans isomer with elongated rodlike molecular shape changes into a cis isomer with bent molecular shape which is less stable. The reverse transformation (cis to trans) can be brought either by irradiation of visible light or spontaneously by the thermal back relaxation process in the dark [3].

Experimental studies show that at given temperature, an increase of the UV light intensity is accompanied by a reduction of the spontaneous polarization (Ps) in the SmC* phase. The observed decrease in the polar order is related to the cis and trans isomers concentration changes under UV irradiation.

We suggest a simple theoretical model to quantitatively characterize the trans-cis and cis-trans photoisomerization processes. The concentrations of trans and cis isomers are deduced from experimental data. The characteristic rate constants of these transformations are determined for a given temperature and light intensity.

A good agreement is found between the experimental and the theoretical model results.

References

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