

# Sticking of liquid crystal on photosensitive polymer layers

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## Abstract

Appearance of a residual image of the previous frame at liquid crystal display due to change of the interface between LC and aligning layers is called as sticking effect. Phenomenologically sticking effect can be associated with changes of direction of easy axis,  $\vec{e}$ , and anchoring energy,  $W$ , during the action of the electric field.

In the case of the rubbed polymer aligning layers sticking effect is mainly caused by accumulation of electric charges near the aligning surfaces. In this case the anchoring of LC with the aligning surfaces is strong ( $W > 10^{-2}$  erg\*cm<sup>-2</sup>) and the surface is rigid. Therefore, electric field does not reorient director on the rubbed aligning surface, and both of these parameters remain constant during the application of the field to the LC cell. In contrary, photoaligning polymers possess very soft surface, containing flexible groups and typically provide much less anchoring energy ( $W < 10^{-2}$  erg\*cm<sup>-2</sup>). In this case the reorientation of the director on the aligning surface is essential. This surface director reorientation can result in realignment of flexible fragments of the polymer, i.e. in the modification of the aligning surface. Therefore, both easy axis and anchoring energy on a soft aligning layer can be changed during the application of the field to the LC cell that should result in a sticking effect.

We have shown that gliding of the easy axis due to flexibility of the side chain group is the main reason of the sticking effect in the cells with photoaligning polymer surfaces. We found that restriction of mobility of the flexible groups on the photoaligning surface (surface strengthening) resulted in depressing of the sticking effect. We have proposed two methods of the surface strengthening: thermal stress of the aligning layer and irradiation of the surface by not-polarized light. The experimental results for a number of photoaligning materials are presented.