# Optical properties of nanocomposites formed by gold nanorods in nematic liquid crystal

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In the present work nanocomposites (NC) consisting of nematic liquid crystal (NLC) – namely 5CB - and gold nanorods were obtained. The nanorods are hemispherical ended cylinders with length about 70 – 100 nm and diameter about 15 – 20 nm. The NC obtained were optically investigated in the cells that were made by two treated glass plates with gap 1.8μm, 4.75μm, 6.1μm, respectively and NC were injected in the cells by capillary method. The optical properties of NC were observed by a polarizing microscope. It was detected, that gold nanorods form inside the oriented liquid crystal matrix different self assembling well-ordered structures (defects) corresponding to spatial distortion of the NLC director field. The size of these defects is much bigger than the size of the nanorods and varies from few to hundreds micrometers.
It is necessary to underline that the size, the shape, the orientation and the ordering of the defects depend on many reasons, namely: on the technology of the cell surface treatment, on the thickness of NC layer and on the cell filling conditions. We show, that the NLC director alignment (coincident with the main optical axis) and the self assembling well-ordered structures axis never match together, what can be explained due to the difference in-between the surface tension of LC and gold nanorods covered by surfactant. The most ordered defects (see figure 1) are in the cells where the gap is 1.8μm, one of the surfaces is anisotropic and the other one is isotropic, the concentration of nanorods in NC is 0.02% and the insertion of NC in the cell is done at the temperature higher than NLC clearing point. At these conditions the defects have elongated stick-like shape, forming a well-ordered regular structure with long axis perpendicular to NLC director (figure 1).

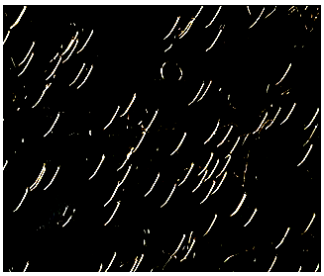

Figure 1. Micro photo of NC layer with thickness 1.8 μm made with crossed polarizers at room temperature. The size is 500 μm × 400 μm.

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