ABSTRACT

In the frame of thesis, the influence of small concentrations (up to 1wt. %) of selected submicroparticles and nanoparticles on the physical properties of low molecular weight organic compounds exhibiting chiral liquid crystalline smectic phases was determined. For the first time, the effect of doping on the properties of the antiferroelectric SmC^*_A phase was presented, by using two types of materials: ferroelectric submicroparticles and nanoparticles of barium titanate (45 and 280nm) and gold nanoparticles (2-4nm) with plasmonic properties. The influence of several concentrations of ferromagnetic maghemite nanoparticles (<50nm) and the influence of oleic acid (decorating factor) on the properties of the ferroelectric SmC* phase were also shown. Both commercially available and newly synthesized materials were used as organic matrices. Four liquid crystalline matrices (including one two-component mixture), eight two-component composites and one three-component composite were prepared and studied. In order to verify the effect of doping on the properties of compounds exhibiting SmC* and/or SmC^*_A phases, comparative studies of composites and matrices were performed using complementary methods, including electro-optic, magnetic, microscopic, spectroscopic, structural, thermal and thermo-optical methods. The motivation for the research was to fill the research gap in the field of detailed analysis of the nanoparticles influence on the properties of the liquid crystalline antiferroelectric SmC^*_A phase. The obtained research results significantly broaden the scope of knowledge in the area of the influence of doping on the properties of chiral liquid crystalline smectic phases.