

Nanocomposites of ferroelectric liquid crystals and FeCo nanoparticles: towards a magnetic response via the application of a small electric field

Romero-Hasler, Patricio N.

Kurihara, Lynn K.

Mair, Lamar O.

Weinberg, Irving N.

Soto-Bustamante, E. A.

Martínez-Miranda, L. J.

We study a nanocomposite consisting of a ferroelectric liquid crystal and a magnetic nanoparticle in order to explore the possibility of using it as a magnetic resonant imaging contrast agent which will measure a field of 20 V/m. To achieve this we use the ferroic properties exhibited by the nanocomposite. We used the ferroelectric liquid crystal 2-(4-((2-fluorooctyl)oxy)phenyl)-5-(octyloxy)pyrimidine mixed with FeCo nanoparticles nominally 2-3 nm in diameter in concentrations of 0.56, 4.3 and 10.8 wt%. The 10.8 wt% sample was chosen for our study because the nanoparticles acted as a lubricant for the ferroelectric liquid crystal. This concentration yields nanoparticle clusters in about 5×10^3 nm diameter spherulites. An electric field as low as 5V/cm is enough to turn and realign the spherulites where the particles are contained. We estimate the value of the magnetic in a spherulite and associate it to the number of spherulites aligned as a function of electric field. We find thus that we can achieve low electric fields.