

International Conference and Exhibition on **Mesoscopic & Condensed Matter Physics**

June 22-24, 2015 Boston, USA

Three-component gyrotropic metamaterial

Igor Tralle, Paweł Zięba and Wioletta Paśko
University of Rzeszów, Poland

We propose a comparatively simple way to fabricate a metamaterial which is both gyrotropic and of simultaneously negative permittivity and permeability. The idea is to make a mixture of three ingredients, where one of them would be responsible for the negativity of μ , while the other two would be responsible for the negativity of ϵ . The first component of the mixture is the 'swarm' of single-domain ferromagnetic nano-particles, immersed in a mixture of other two, silver and mercury cadmium telluride. In the work we carried out computer simulations in the frame of the proposed model in order to establish the domains of existence of such material searching through the vast parameter space. The main result of the paper can be summarized as follows. In the framework of the model, we succeeded in establishing the domains of gyromagnetic metamaterial existence, relative to all parameters characterizing the model that is, temperature, external magnetic field, parameters of nano-particles, and fraction of cadmium in $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$ - compound as well as the relative concentrations of the mixture components. Negative refraction and optical activity can be achieved only if the material is in external, however moderate magnetic field. On the other hand, in some circumstances, it could be an advantage, since switching magnetic field on and off, one can trigger off negative refraction.

Biography

Igor Tralle is a Physics Professor at the Faculty of Mathematics and Natural Sciences, University of Rzeszów. His research interests are concentrated around Solid State and Semiconductor Physics, charge carrier transport in low-dimensional and quantum structures, linear and nonlinear Optics, quantum cascade lasers as well as Mathematical Physics. During the last couple of years his research interests are moving also towards THz detection and generation and metamaterials. He is an author or co-author of about 100 research papers published in high-rank peer reviewed scientific journals.

tralle@univ.rzeszow.pl

Notes: