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Magnetic Field Effects of Light Scattering from Fluorinated Multi-Layer Graphene Flakes in Ground and Excited States Suspended in Organic Solvents BIN HU, LEI HE, MINGXING LI, Department of Materials Science and Engineering, University of Tennessee-Knoxville, ZHENG GAI, Oak Ridge National Laboratory, AUGUSTINE URBAS, Air Force Research Laboratory — Magnetic field effect of light scattering (MFELS) can be developed by magnetic polarization-induced alignment of magnetic nanoparticles suspended in liquid states. The MFELS can reflect the magnetic polarization in ground and excited states, when an external photoexcitation is applied, and the magnetoelectric coupling, when the host solvent is changed with a different dielectric constant, in magnetic nanoparticles. We report a giant MFELS with a magnitude over 80 % from fluorinated multi-layer graphene (FG) suspended in organic solvents. Applying a magnetic field ($<$900 mT) can remarkably increase the light scattering intensity from the suspended FG flakes. This indicates that a magnetic field can cause an alignment of suspended FG flakes due to anisotropic magnetic polarization effects. We find that increasing the dielectric constant of host solvent can largely enhance the MFELS magnitude. This phenomenon implies that the electrical polarization is intrinsically coupled with the magnetic polarization in the FG flakes, suggesting a new mechanism for magnetoelectric coupling. Furthermore, we show that a photoexcitation can lead to an enhancement on the MFELS magnitude from the suspended FG flakes. This indicates that the excited states can generate a stronger magnetic polarization through magnetoelectric coupling in the suspended FG flakes.

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