Magnetic metamaterials

Vassilios Kapaklis

Department of Physics & Astronomy, Uppsala University, Sweden
E-mail address: vassilios.kapaklis@physics.uu.se

Metamaterials are artificial materials with an engineered periodic structure aiming in properties which cannot be found in nature. Lithographically nano-patterned magnetic materials can result in fascinating behaviour exploiting the magnetic dipolar interactions between individual elements. The emergent properties in such systems are distinctly different from those of their constituent components, driven by the collective dynamics of the interacting elements and respond to external stimuli such as magnetic fields or temperature. Further enhanced functionality can be realised exploiting the fact that the periodicity and element size in such nano-patterned magnetic arrays matches well the wavelengths of visible light, thus providing an ideal setting for the investigation of the interaction of light with magnetic metamaterials. I will present approaches for the fabrication of magnetic metamaterials using thin films. Recent works have demonstrated the creation of reconfigurable magnetic structures which undergo phase transitions and exhibit dynamics on adjustable length- and energy-scales [1-8]. The interaction of visible light with such structures also reveals the opportunity of "steering" light and altering optical properties using such magnetically reconfigurable metasurfaces [9].

References

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