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Self-assembly of polymer coated iron oxide nanoparticles in magnetic field

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Functional nanocomposites are an important class of smart and adaptive materials. They offer a broad application range from sensors through stretchable electronics to energy conversion and human health. Especially, responsive materials which are able to perform self-assembly in different environments (e.g. magnetic field) are in the center of interest. Further developments in this area would significantly benefit from deeper insights into the self-assembly of the nanoparticles depending on the temperature, external field strength, initial distance between particles etc.

Iron oxide nanoparticles grafted with polymer play the significant role in creating magnetically tunable photonic crystal systems. Self-assembly of these nanocomposites can be controlled by varying the core-polymer shell size and the strength of external field. In our scattering experiments we show that application of the magnetic field to the paramagnetic nanoparticles results in ordered crystal structure formation. Moreover, the crystal structure and lattice parameter changes with the magnetic field strength and demonstrate a phase transition.

We established synthesis of highly monodispersed iron oxide nanoparticles
of different size grafted with polymer and use them to control the self-assembly of nanocomposite varying external parameters: temperature, magnetic field strength and mechanical stress.

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