

# Self-assembly of large iron oxide nanoparticles in ultrahigh molecular weight linear diblock copolymer films

*Tuesday, 25 June 2019 16:15 (1 hour)*

The preparation of block copolymer (DBC) nanocomposite films that consist of magnetic nanoparticles (NPs) with diameters (D) of more than 10 nm is a challenging task. In the present work, this limitation is addressed by using an ultrahigh molecular weight (UHMW) DBC polystyrene-block-poly(methyl methacrylate) (PS-b-PMMA) as templates for the self-assembly of periodic hybrid materials containing large iron oxide NPs ( $D = 27 \pm 0.6$  nm). Via hydrogen bonding between the carboxylic acid groups on the iron oxide NPs and the PMMA side chains of the DBC, the NPs are selectively incorporated inside the PMMA cylinders. Due to the rearrangement of the polymer chains for accommodating the NPs, a well-ordered cylindrical nanostructure is readily generated at low NP concentration ( $c = 0.5$  wt%). Most interestingly, a chain-like network appears inside the hybrid films at a high NP loading ( $c \geq 10.0$  wt%). Additionally, the magnetic properties of the hybrid films are determined at various temperatures in one direction (with PMMA cylinders vertical to the applied magnetic field). All hybrid films show ferromagnetism, but the hysteresis loops narrow slightly with increasing temperatures.

**Primary authors:** CAO, Wei (TU München); XIA, Senlin (Lehrstuhl für Funktionelle Materialien, Physik Department E 13, Technische Universität München); JIANG, Xinyu (Technische Universität München Fakultät für Physik); Dr APPOLD, Michael (TU Darmstadt); Dr OPEL, Matthias (WSI Garching); Dr GALLEI, Markus (TU Darmstadt); SCHWARTZKOPF, Matthias (DESY); ROTH, Stephan (DESY / KTH); MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien)

**Presenter:** CAO, Wei (TU München)

**Session Classification:** Poster session