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Nanoparticle arrays controlled by polymeric ligands CHUN-KWEI WU, JEFFREY T. KOBERSTEIN, Columbia University — Ligand chemistry on nanoparticles plays an important role in applying their unique properties to the real world. The original capping ligands on nanoparticles, i.e. oleic acid, limit their compatibility with some bulk materials of interest and can restrict some potential applications. We have successfully exchanged the original oleic acid ligands on γ-Fe_2O_3 nanoparticles with ω-poly(dimethylsiloxane) (PDMS). A high grafting density of PDMS on iron oxide nanoparticles has been achieved by this "grafting to" method. Fe_2O_3 nanoparticles with PDMS ligands self-assemble with hexagonal packing when deposited on substrates. The interparticle spacing can be controlled by varying the molecular weight of the PDMS. The PDMS-modified Fe_2O_3 nanoparticles are totally compatible with bulk PDMS allowing nanocomposites to be formed. The PDMS components in resultant thin films can subsequently be converted to silicon oxide by room temperature UV/ozone treatment to fabricate Fe_2O_3-silica composite thin films. The use of such nanocomposite films in gas separation and catalyst membranes is being studied.

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