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Alignment of Magnetic Nanoparticles in Polymer Films ECEM YARAR, Department of Chemical Engineering, Yeditepe University, Istanbul, 34755, Turkey, DENIZ RENDE, Department of Materials Science and Engineering, Rensselaer Nanotechnology Center, Rensselaer Polytechnic Institute, Troy, NY 12180, USA, SEYDA BUCAK, Department of Chemical Engineering, Yeditepe University, Istanbul, 34755, Turkey — Polymer nanocomposites are advanced materials, which are obtained by the addition of natural or synthetic nanosized inorganic fillers into the polymeric material. The addition of trace amounts of nanoparticles could enhance the polymer's mechanical, thermal, electrical and optical properties due to their size and high surface area/volume ratio. In this work, magnetite/PMMA nanocomposites were prepared either by randomly dispersing or by aligning magnetite nanoparticles in the matrix using an external magnetic field. Oleic acid coated iron oxide nanoparticles (magnetite) were used as nanofiller. 7-9 nm iron oxide nanoparticles were synthesized by co-precipitation method with different surfactant amounts and at different synthesis temperatures. Superparamagnetic property of bare iron oxides was confirmed by Vibrating Sample Magnetometer (VSM) analysis. Thermogravimetric Analysis (TGA) measurements were used to calculate the surface coverage of the oleic acid on iron nanoparticles, which increases with increasing oleic acid concentration and consistent across synthesis temperature. Dispersion and alignment of nanoparticles through the polymer film were investigated with TEM and SEM. Results showed that magnetic nanoparticles formed under the influence of an external magnetic field were aligned and formed rods consisting of individual nanoparticles.

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