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Magnetic Alignment of γ-Fe_2O_3 Nanoparticles in Polymer Nanocomposites ANDREW JIMENEZ, SANAT K. KUMAR, Columbia University, JACQUES JESTIN, Laboratoire Lon Brillouin — Recent work in nanocomposites has been heavily focused on controlling the dispersion state of filler particles. The use of internal self-assembly based on matrix properties provides a limited solution to the desire for specified organizations. By introducing a magnetic field during the casting of a polymer solution it has been shown that particles can be oriented to form anisotropic structures – commonly sought after for improved mechanical properties. Here, magnetic nanoparticles were cast in two different polymer matrices to study the effect of various forces that lead to this highly desired alignment. The addition of the magnetic field as an external trigger was shown to not necessarily force the clustering, but rather orient the agglomerates already available in solution. This demonstrates the importance of other dominant forces introduced into the system by characteristics of the polymers themselves. While this magnetic field provides a direction for the sample, the key forces lie in the interactions between the polymers and nanoparticles (as well as their solvent). The study shows a dependence of anisotropy on the particle loading, matrix, and casting time, from which continued work hopes to quantify the clustering necessary to optimize alignment in the composite.

Andrew Jimenez
Columbia University

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