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Probing the interfacial region in polymer-graphene oxide nanocomposites MICHAEL WEIR, Department of Physics and Astronomy, University of Sheffield, STEPHEN BOOTHROYD, DAVID JOHNSON, RICHARD THOMPSON, Durham University, NIGEL CLARKE, University of Sheffield, KARL COLEMAN, Durham University — Graphene and related two-dimensional materials are excellent candidates as filler materials in nanocomposites due to their extraordinary physical properties and high aspect ratio. We are studying graphene oxide (GO), a highly functionalized form of graphene, due to its relative ease of dispersion within polymer matrices. Interruptions to the pristine two-dimensional carbon network by oxygen-containing groups, which provide functionality, also make GO rather flexible. In this paper we show that GO is wrinkled and rough over a hierarchy of length scales from a few nanometers to a few microns, when it is incorporated in composites with poly(methyl methacrylate) (PMMA) and polystyrene (PS). Small-angle neutron scattering measurements, highlighting individual polymer chains, show a decrease in polymer radius of gyration with increasing GO concentration in PMMA/GO nanocomposites. The decrease is consistent with models of a solid interface in a polymer melt. The interface influences the polymer matrix within an interfacial volume stretching on the order of one polymer radius of gyration from the surface. This work is a direct measurement of the effect of the nanofiller upon the polymer matrix and progresses our understanding of interfacial interactions within nanocomposites.

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