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Dispersion and Alignment of CdSe Nanorods in Polymer Nanocomposites BORIS RASIN, The University of Pennsylvania, AMALIE FRISCHKNECHT, Sandia National Laboratories, BENJAMIN DIROLL, LINDSAY TSAI, CHRISTOPHER MURRAY, RUSSELL COMPOSTO, The University of Pennsylvania — The thermodynamic factors that affect the dispersion of polymer-brush grafted nanorods (NR) added to homopolymer matrix films have been studied by both experiments and theory. Whereas prior studies have focused on gold nanorods with fixed diameter (12nm-16nm) and varying length (37nm to 98 nm), these studies investigate the smaller diameter (4 nm) CdSe nanorods with length 27 nm to determine if nanorod curvature increases wetting between brush and matrix chains. Here we investigate two chemically similar brush / matrix systems polystyrene (PS)-NR / PS and poly(ethylene oxide) (PEO)-NR/PEO as a function of matrix to brush degree of polymerization, P/N. For the PS-NR / PS system for P/N=.5 the nanorods observed in the polymer matrix are primarily either individual nanorods or individual chains of end to end positioned nanorods. For P/N=13 aggregates consisting of side to side positioned nanorods and side to side positioned nanorod chains are observed. Individual nanorods and individual nanorod chains are also observed. The transition from wet to dry brush is explored and compared with the gold NR studies as well as density functional theory calculations. The effect of electrical field alignment on nanorod orientation is also presented.

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