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Dielectrophoretic alignment of montmorillonite nanoplatelet suspensions in an organic matrix EVANGELOS MANIAS, Materials Science and Engineering, Penn State University, GEORGIOS POLIZOS, Penn State University, HILMAR KOERNER, RICHARD VAIA, Air Force Research Lab/MLBP — High orientational alignment of pseudo-two-dimensional inorganic platelets in an organic matrix is achieved by external AC electric fields ($\sim$0.5V/μm, rms). Namely, montmorillonite alumino-silicate platelets are organically modified by alkyl-ammonium surfactants and dispersed in an uncrosslinked epoxy. Orientation is quantified through wide angle 2D X-Ray diffraction under an AC electric field ($\sim$0.05-4V/μm), following the reorientation of inorganic stacks (tactoids), resulting in Hermans orientation factors of 0.7–0.9 even at moderate field strengths. The degree of orientation dependence on the electric field frequency and strength is presented. The electrophoretic motion of the cationic surfactants as a possible mechanism to produce alignment is delineated via broadband (10^{-2}-10^{7} Hz) dielectric relaxation spectroscopy, and dipole moment theoretical analyses. The cationic electrophoretic motion does not have any major contribution for the platelet alignment, suggesting that the primary cause is due to induced dipoles (image charges) on the dielectric inorganic platelets.

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