

Abstract Submitted
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Analysis of Crystallization on Polymeric Thin Films Deposited on Silicon Dioxide ETHAN CUMMINGS, James Madison University — Polyvinyl Alcohol (PVA) is a synthetic polymer containing carbon chains with hydroxide groups bonded to every other carbon. Poly (propylmethacrylisobutyl POSS co-methylmethacrylate) (POSS-MA) is a co-polymer that contains polyhedral oligomeric silsesquioxane (POSS) cages co-polymerized to a poly methyl methacrylate (PMMA) backbone. PVA is dissolved into water at various concentrations and coated onto a silica wafer using spin casting. Then, various concentrations of 30-40 wt% POSS-MA are dissolved in chloroform and deposited onto the same sample. After spin casting, these samples are analyzed using AFM and ellipsometry. Typical samples of POSS-MA and PVA/POSS-MA thin films exhibit varying rates of microphase separation in the form of dendritic structures. Once separation is completed, the pixel areas of the dendrite structures are measured using IDL. These varying area determinations are normalized, and then fit to an Avrami plot by graphing $\ln(-\ln(1-f))$ vs. $\ln(\text{time})$, where “f” is normalized area, and the time is the time after deposition. On the graphs, the slope is the dimensionality of the growth constant, and the y-intercept is the natural log of the rate constant ($\ln(k)$). Samples also undergo ellipsometry to determine the thickness of the SiO_2 /PVA/POSS-MA thin films. Additional experiments include a process that etches away the PVA thin film layer in water, leaving the POSS-MA thin film layer on the surface of the water. The thin film is then lifted onto a TEM grid to be analyzed using TEM.

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