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Polycaprolactone for Inorganic Materials Infiltration: A Promising Addition to Sequential Infiltration Synthesis Polymer Family¹ MAHUA BISWAS, Department of Physics, Illinois State University, JOSEPH LIBERA, Applied Materials Division, Argonne National Laboratory, SETH DARLING, Chemical Sciences Engg. Div., AMEWS Energy Frontier Research Center, Argonne National Lab, Pritzker School of Mol. Engg., Univ. of Chicago, JEFFREY ELAM, Applied Materials Division, AMEWS Energy Frontier Research Center, Argonne National Laboratory — Infiltration of inorganic materials inside polymers is receiving a lot of attention for creating hybrid materials and patterned nanostructures. Sequential infiltration synthesis (SIS), derived from atomic layer deposition (ALD), involves gas phase reactions to infiltrate polymers with inorganic materials. The reactions between various polymer functional groups and inorganic precursors are unique, which makes it essential to understand the specific interactions for a range of precursors and polymers. In this work, in situ Fourier transform infrared spectroscopy (FTIR) measurements have been performed during Al₂O₃ and TiO₂ SIS in three homopolymers: poly(methyl methacrylate) (PMMA), poly(ϵ -caprolactone) (PCL), and poly(2-vinylpyridine) (P2VP). From the FTIR intensity, it is shown quantitatively that the interaction dynamics of these polymers with the metal precursors are substantially different. A key finding from this comparative study is that PCL interacts far more strongly with metal precursors compared to PMMA and P2VP. PCL may be an attractive polymeric template for inorganic infiltration processes, which has not been reported previously.

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