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Visualization and Analysis of the Dynamics of Methanol Transport in Poly(Methyl Methacrylate) ADAM EKENSEAIR, RICHARD KETCHAM, NICHOLAS PEPPAS, The University of Texas at Austin — The relative rates of the diffusional and relaxational processes during the absorption of penetrant molecules in glassy polymers determine the nature of the transport process and lead to a myriad of transport phenomena, such as Fickian, Case II, and anomalous absorption behavior. Many proposed models account for the majority of anomalous behavior that has been observed. However, there is still a disconnect between theory and experiment, as data must be fit to the model and adjustable parameters determined. We propose that a better understanding of the dynamics of penetrant transport in glassy polymers can be achieved by careful and detailed investigations into the role the polymeric network structure plays in influencing the transport mechanism. We introduce a novel technique to visualize and quantify transport dynamics and mechanisms in- situ. High-resolution X-ray computed tomography, a completely nondestructive technique that can be used to visualize features in the interior of opaque solids, has been successfully adapted to examine the transport dynamics of methanol into glassy poly (methyl methacrylate) discs synthesized by an iniferter- mediated free radical polymerization. In addition to tracking methanol absorption and dimensional swelling, the time- dependent concentration profiles within the polymer disc were determined.

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