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Reaction Rate Acceleration and Tg Depression of Polycyanurate Under Nanopore Confinement EVELYN LOPEZ, SINDEE L. SIMON, Texas Tech University — Material properties such as Tg and the reaction kinetics are known to deviate from the bulk when subjected to nano-sized confinement. Previous work from our laboratory on the trimerization of cyanate esters found that the reaction kinetics were faster for a monofunctional reactant compared to a difunctional monomer, whereas the Tg depression was greater for the crosslinked product of the latter compared to the low molecular weight trimer of the former. The origin of the changes in nanoconfined reaction rates differs from those that govern changes in the Tg. The research objective is to further explore the effect that confinement has on reaction kinetics and Tg using a mixture consisting of mono- and di- cyanate ester monomers. The product is an uncrosslinked polycyanurate with Mn = 5240 g/mol and PDI = 1.78. The confinement mediums are controlled pore glasses with diameters ranging from 8.1 to 111.1 nm. The nanopore-confined material was synthesized in-situ and the reaction kinetics are followed by DSC; after the reaction, the Tg values of the nanoconfined polymer where also measured by DSC. An acceleration factor of 13 and a Tg depression of 38 °C are observed for the material confined in the smallest 8.1 nm-diameter pores. The Tg depression is between those of the trimer and network previously studied, while the acceleration of the reaction rate is lower. Our results are consistent with the reaction acceleration arising from packing effects at the pore wall and the Tg depression arising from intrinsic size effects.

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