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The Effect of Nanoconfinemnt on Methyl Methacrylate Polymerization: Reactivity and Resulting Properties[1] HAOYU ZHAO, ZINIU YU, RONALD HEDDEN, SINDEE SIMON, Texas Tech University — The effect of nanoconfinement is well known to affect the properties of polymers. In this work, free radical polymerization of methyl methacrylate (MMA) is performed in hydrophilic or hydrophobic 13 nm diameter controlled pore glass (CPG). Changes in polymerization kinetics and the properties of the synthesized polymer are quantified. Reaction kinetics and glass transition temperatures are followed by differential scanning calorimetry (DSC). After polymerization, the changes in the molecular weights and tacticity are measured using gel permeation chromatography (GPC) and 1H nuclear magnetic resonance (1H NMR). Nanoconfinement is found to result in earlier onset of autoacceleration leading to the increase in both number-average and weight-average molecular weights, whereas the polydispersity index at full conversion decreases relative to the bulk value. Moreover, for both pore surfaces, the glass transition temperature increases compared with the bulk, but the increase in hydrophilic pores is more pronounced at 20 °C. In addition to the changes in molecular weight and Tg, the tacticity changes from syndiotactic-rich triads for the bulk PMMA to a higher percentage of isotacticity under nanoconfinement.

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