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Study of Low Molecular Weight Impurities in Pluronic Triblock Copolymers using MALDI, Interaction Chromatography, and NMR Z. HELMING, D. ZAGOREVSKI, C.Y. RYU, Rensselaer Polytech Inst — Poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide) triblock copolymers are a group of commercial macromolecular amphiphilic surfactants that have been widely studied for their applications in polymer-based nanotechnology and drug-delivery. It has been well-established that the synthesis of commercial Pluronic triblocks results in low molecular weight “impurities,” which are generally disregarded in the applications and study of these polymers. These species have been shown to have significant effects on the rheological properties of the material, as well as altering the supramolecular “micellar” structures for which the polymers are most often used. We have isolated the impurities from the bulk Pluronic triblock using Interaction Chromatography (IC) techniques, and subjected them to analysis by ^1H NMR and MALDI (Matrix-Assisted Laser Desorption Ionization) Mass Spectrometry to identify relative block composition and molecular weight information. We report significant evidence of at least two polymeric components: a low-molecular-weight homopolymer of poly(ethylene oxide) and a “blocky” copolymer of both poly(ethylene oxide) and poly(propylene oxide). This has significant implications, not only for the applied usage of Pluronic triblock copolymers, but for the general scientific acceptance of the impurities and their effects on Pluronic micelle and hydrogel formation.

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