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**3D Printing of a Thermoplastic Shape Memory Polymer using FDM** ZHIYANG ZHAO, R.A. WEISS, BRYAN VOGT, Department of Polymer Engineering, University of Akron — Shape memory polymers (SMPs) change from a temporary shape to its permanent shape when exposed to an external stimulus. The shape memory relies on the presence of two independent networks. 3D printing provides a facile method to fabricate complex shapes with high degrees of customizability. The most common consumer 3D printing technology is fused deposition modeling (FDM), which relies on the extrusion of a thermoplastic filament to build-up the part in a layer by layer fashion. The material choices for FDM are limited, but growing. The generation of an SMP that is printable by FDM could open SMPs to many new potential applications. In this work, we demonstrate printing of thermally activated SMP using FDM. Partially neutralized poly(ethylene-co-r-methacrylic acid) ionomers (Surlyn by Dupont) was extruded into filaments and used as a model thermoplastic shape memory material. The properties of the SMP part can be readily tuned by print parameters, such as infill density or infill direction without changing the base material. We discuss the performance and characteristics of 3D printed shapes compared to their compression molded analogs.

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