

Pushing the Limits of SLA Printed Molds

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Abstract

Polydimethylsiloxane (PDMS) is a silicone-based organic polymer substrate used to develop microfluidic platforms. Traditionally, PDMS microchannels are cured in cleanroom generated casting molds to create micro-scale (< 100 μm) geometric features. Inexpensive SLA desktop printers can generate molds with features in the tens of microns, so SLA molds would seem to be a cheaper and faster alternative for creating PDMS microchannel structures. Unfortunately, chemicals in SLA resins can inhibit the curing process of PDMS. This project is exploring a variety of post-processing parameters (washing the resin molds, extended curing with UV light, and elevated temperatures) using various commercially available resins to prevent curing inhibition when using SLA as a mold material. Sample resin molds (20x20x5 mm) were created using SolidWorks. After allowing the PDMS to cure at various settings, the samples were removed from the mold and manually inspected by touch; uncured PDMS retains an undesirable tackiness at the surface between PDMS and the SLA mold. Preliminary results indicate that the best PDMS curing after three days consist of the following parameters: 60 minutes of washing in IPA, UV curing the resin submerged in water for 15 minutes, and baking standard resin molds for one hour at 80 °C. In contrast, ECO resin molds cure optimally after 3 days with the following parameters: 30 minutes of washing in IPA, UV curing the resin for 30 minutes not submerged in water, and baking for 1 hour at 80 °C. Further studies will continue to identify and optimize the post-processing parameters.

Biography of Presenter

Alejandra Rivera Ramos is an undergraduate Industrial Biotechnology student at the University of Puerto Rico – Mayagüez Campus (UPRM). She worked as an assistant lab technician in the microbiology department at UPRM. She is also part of the international chamber choir (Chorium) at the UPRM Band and Orchestra Department. Currently, she is an undergraduate researcher at the University of Louisville's IMPACT-NG REU under the mentorship of Dr. Tommy Roussel.

