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PDMS-co-PVMS Copolymer Synthesis for Microfluidic Devices[1]
ARISSA BAIAMONTE, DEVIN NGUYEN, BARAKA LWOYA, GIOVANNI KELLY, JULIE N. L. ALBERT, Tulane Univ — Poly (dimethylsiloxane) (PDMS) is the predominant material used for the fabrication of microfluidic devices because it is an easily synthesized, biocompatible, and flexible material that forms a good seal with other surfaces. However, PDMS is chemically inert and therefore difficult to functionalize for targeted applications, it can swell in the presence of organic solvents, and it can contaminate microfluidic solutions with unreacted oligomers. Therefore, my research goal is to synthesize random copolymers of PDMS and poly (vinylmethylsiloxane) (PVMS) that retain the benefits of PDMS and can be functionalized easily via thiol-ene click reactions. In the first stage of this work, dichlorodimethylsilane and vinylmethyldichlorosilane were each reacted with water to produce n-membered dimethylsiloxane rings and n-membered vinylmethylsiloxane rings, respectively. In the next step, polymers are synthesized by reacting these rings with potassium hydroxide and heat to form PDMS, PVMS, and PDMS-co-PVMS copolymers. Several reaction conditions have been tested to determine the kinetics and to relate molecular weight of the polymer or copolymer to reaction time. The polymer is then cross-liked through hydroxyl end groups with vinylmethoxysiloxane homopolymer (PVMES) cross-linker, tin catalyst, and heat. Once the polymer is cross-linked, the surface can be modified via thiol-ene click reaction to provide a diversity of surface functionality for microfluidic device applications. In the present work, we functionalize with a fluorinated thiol to impart solvent resistance.

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