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“From Molecules to Manufacturing: Developing Novel Polymers for 3D Printing”

Abstract

Additive Manufacturing (AM), often referred to as 3D Printing, is a manufacturing technique that fabricates objects in a layer-by-layer process. AM can fabricate objects with complex geometries that are impossible to create using conventional manufacturing techniques. Parts with geometric complexity are lighter, require less raw material, and can offer improved functionality and strength. While AM can offer many advantages over conventional manufacturing techniques, the palette of materials that manufacturers have to work with is quite limited. To expand the industries and applications to which AM can be applied, new materials must be developed with properties specifically tailored to the AM fabrication process.

This research has leveraged the expertise of polymer chemists, mechanical engineers, and materials scientists to develop, characterize, and print novel polymers with Mask Projection Microstereolithography (MPμSL). We have developed several novel polymers, the majority of which are strong candidates for biocompatible tissue scaffolds. Commercially available poly(propylene glycol diacrylate) (PPGDA) and poly(ethylene glycol diacrylate) (PEGDA) were processed into scaffolds and found to possess acceptable biocompatibility. However even greater potential lies in the employment of polymers that are not yet commercially available. Current work focuses on synthesizing new polymers that can be tuned to have a variety of mechanical properties, ionic conductivity and degradation rates as well as improved cell adhesion and reduced cytotoxicity.

Biosketch:

Nicholas Chartrain is a Ph.D. candidate coadvised by Prof. Abby Whittington and Prof. Christopher Williams. He completed his undergraduate degree in Materials Science & Engineering at Cornell University in 2013. Nick is passionate about Additive Manufacturing/3D Printing and has been involved with research in the field since 2009.