

# Designing Hydrogel Inks for Extrusion Printing

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## Abstract

Our laboratory is interested in developing new biomaterials for 3D printing, as well as new printing processes to expand the utility of 3D printing in biomedical applications. This includes towards the development of enabling technologies to advance our toolbox of materials and printing approaches for 3D printing in precision medicine. Hydrogels represent a class of biomaterials that have great promise for these applications, particularly due to our ability to engineer their biophysical and biochemical properties and the potential for cell encapsulation during printing. This presentation will provide an overview of our approaches to advance the applications of hydrogels in extrusion-based 3D printing. This includes the engineering of shear-thinning and self-healing hydrogels that can act as bioinks or as media for embedding printing technologies, where various materials can be printed anywhere within 3D space and as sacrificial materials to form channels. Further, we have developed both direct-curing and jammed microgel technologies to print photocrosslinkable hydrogels that do not meet the stringent requirements (e.g., rheological properties) for current printing techniques. Examples will be provided in how these new materials and techniques have been used in the engineering of in vitro models (e.g., vessels) and for translational tissue repair applications (e.g., cartilage repair).

## Biography

Jason A. Burdick, PhD is the Robert D. Bent Professor of Bioengineering at the University of Pennsylvania. Dr. Burdick's research involves the development of hydrogels through techniques such as photocrosslinking and self-assembly and their processing using approaches such as electrospinning and 3D printing. The applications of his research range from controlling stem cell differentiation through material cues to fabricating scaffolding for regenerative medicine and tissue repair. Jason currently has over 240 peer-reviewed publications and has been awarded a K22 Scholar Development and Career Transition



Award through the National Institutes of Health, an Early Career Award through the Coulter Foundation, a National Science Foundation CAREER award, a Packard Fellowship in Science and Engineering, and an American Heart Association Established Investigator Award. He was recently awarded the Clemson Award through the Society for Biomaterials and the George H. Heilmeyer Faculty Award for Excellence in Research. He is on the editorial boards of *Tissue Engineering*, *Biofabrication*, and *Advanced Healthcare Materials*, and is an Associate Editor for *ACS Biomaterials Science & Engineering*.