

# Direct Ink Writing of Multifunctional Structures using Solution-based Nanoinks

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There is currently an increasing interest to pattern 2D/3D solution-based materials (i.e. inks) using additive manufacturing. Resulting printed multifunctional structures can be utilized in numerous applications, from energy to sensing and soft robotics. Therein, we focus on direct ink writing (DIW) fabrication which is capable of extruding inks at room temperature using external pressure. Inks of disparate phases and a wide range of viscosities can be patterned, on digitally pre-defined substrate locations, with  $\mu\text{m}$  resolution through a robotically-controlled nozzle. Although the DIW process is conceptually straightforward, there are still a few important challenges that need to be tackled before wider adoption. These challenges are interrelated spanning ink synthesis and formulation, equipment development, quantification of printability, post-processing, and resulting printed parts properties. During this talk we will discuss some of our groups' latest projects related to DIW of multifunctional materials. More specifically, DIW of emulsions for fabricating 3D hierarchical foam photocatalytic structures will be presented along with the development of directly written graphene gas sensors. Additionally, I will be presenting our unconventional approach to pattern and texture thin films using surface-force driven direct writing of low viscosity inks. Through these examples I will illustrate the versatility and future potential of this method.

Students, meet the speaker after the seminar in a student/postdoc session from 5:45-6:15 pm

Date: Wed, Dec. 2, 2020

Time: 4:30-5:30 pm

Location: Virtual Seminar (Zoom)