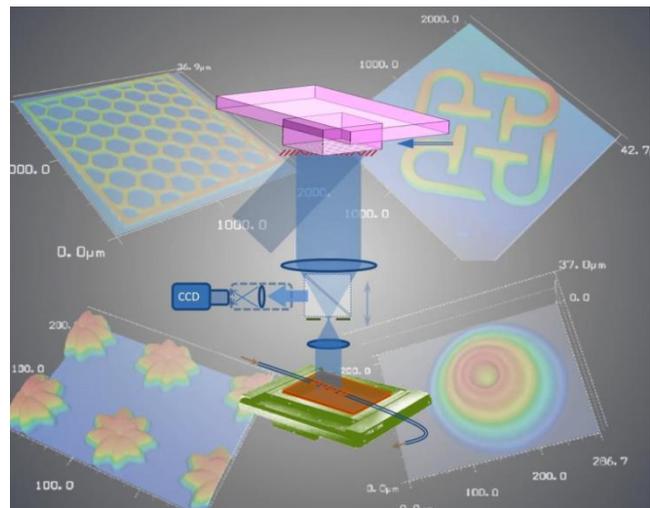


New Technology Enables 3D Patterning of Ionic Hydrogels for Functional Devices and Sensors

Ionic hydrogel is a kind of special polymeric material with highly ionic conductivity and stimuli responsivity. As a representative, poly(acrylic acid) (PAA) has recently attracted remarkable attentions due to its high ion-conducting performance, pH responsivity and good thin-film formability. It is therefore deemed very promising in the fields of tissue engineering, controlled drug release, catalysis, energy storage, sensors and actuators. However, ionic hydrogels are very difficult to be processed in micrometer scale by using conventional technologies, which thus hampers the applications of ionic hydrogels, particularly in miniature devices and sensors.

In order to overcome this bottleneck, Dr. A. Ping Zhang and his team members of the Department of Electrical Engineering of The Hong Kong Polytechnic University developed a new optical microfabrication technique for patterning ionic hydrogels for device development. By integration of a high-speed spatial light modulator with a high-precision motorized stage and machine-vision modules, an optical maskless stereolithography technology is developed to directly pattern PAA ionic hydrogels into computer generated 2D/3D microstructures. In the experiments, various complex 2D/3D PAA microstructures were rapidly printed (exposure time is around 10 ~ 30 seconds) on a glass substrate via precisely controls of dynamic exposure and polymerization processes. Using the developed technology, Dr. Zhang and his team members demonstrated to *in situ* fabricate periodic PAA micro-pads on the surface of an optical micro-fiber with the diameter of 30 μm and excite the optical fiber-mode coupling and resonances for highly sensitive pH sensing.



Such an optical microfabrication technology can be utilized as a common approach for micro-patterning various kinds of hydrogels, and thus paves a way for exploiting the applications of hydrogels in functional micro-devices and sensors. The research has been published on *Advanced Materials* ([DOI:10.1002/adma.201504021](https://doi.org/10.1002/adma.201504021)) and highlighted by *Materials Views China* (<http://www.materialsvschina.com/2016/02/paa-fast-3d-micro-fabrication-technology-of-ionic-hydrogel-and-its-ph-sensors/>).