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Dynamic micromolds to fabricate multi-layered hydrogel microstructures HALIL TEKIN, Department of Electrical Engineering and Computer Science, MIT, TONIA TSINMAN, Department of Biological Engineering, MIT, JEFFERSON G. SANCHEZ, Department of Chemical Engineering, MIT, BRIANNA J. JONES, Department of Physics, MIT, ROBERT LANGER, Department of Chemical Engineering, MIT, ALI KHADEMHOSSEINI, Center for Biomedical Engineering, Brigham and Women's Hospital, Harvard Medical School — Hydrogel microstructures can be used to mimic living systems and create drug carriers. Living materials can be encapsulated within multi-layered microgels to replicate native tissues. Furthermore, multiple drugs can be immobilized within different layers of microgels to create multifunctional drug carriers. Photolithography is a commonly used method to create these multi-layered microgels, but it is not applicable to non-photocrosslinkable materials. Also, conventional micromolding methods do not allow creating multi-layered microgels due to the static environment of the microstructures. Herein, we created dynamic micromolds by exploiting the thermoresponsiveness of poly(N-isopropylacrylamide). These micromolds allowed sequential molding of microgels at different temperatures. Different cell types were spatially immobilized in different layers of microgels to replicate native tissue complexity. Furthermore, fluorescent microbeads were spatially immobilized within different microgel layers to show a concept of drug carriers which could encapsulate various drugs. These dynamic micromolds could be potentially useful in creating multilayered hydrogel microstructures in order to mimic biological systems and fabricate multifunctional drug carriers.

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