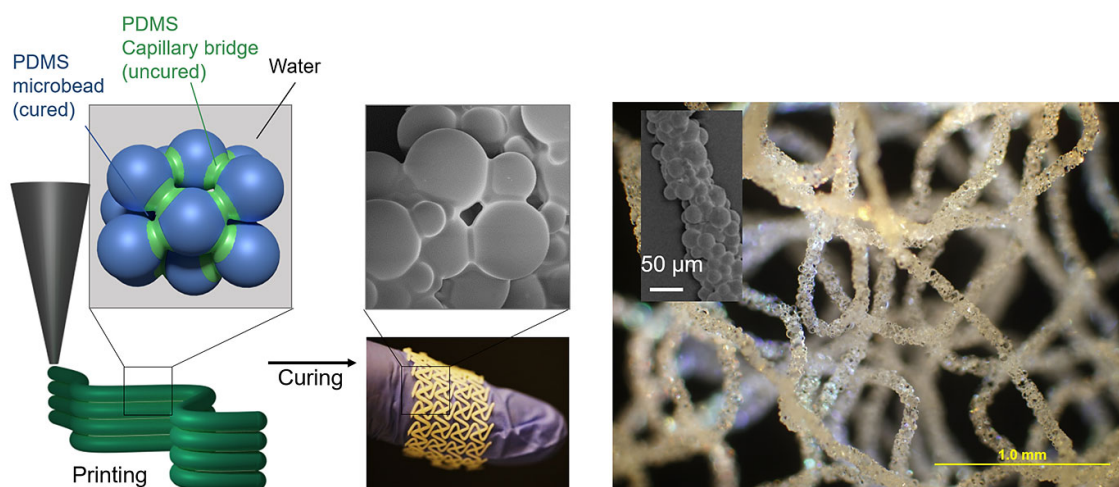


New technique enables 3-D printing with paste of silicone particles in water

June 7 2017, by Mick Kulikowski



New technique published in *Advanced Materials* shows the process of 3-D printing silicone rubber. Credit: Orlin Velev, NC State University

Using the principles behind the formation of sandcastles from wet sand, North Carolina State University researchers have achieved 3-D printing of flexible and porous silicone rubber structures through a new technique that combines water with solid and liquid forms of silicone into a pasty ink that can be fed through a 3-D printer. The finding could have

biomedical applications and uses in soft robotics.

In a paper published this week in *Advanced Materials*, corresponding author Orlin Velev and colleagues show that, in a water medium, liquid [silicone rubber](#) can be used to form bridges between tiny silicone rubber beads to link them together—much as a small amount of water can shape sand particles into sandcastles.

Interestingly, the technique can be used in a dry or a wet environment, suggesting that it has the potential to be used in live tissue - think of an ultraflexible mesh encapsulating a healing droplet, or a soft bandage that can be applied or even directly printed on some portion of the human body, for example.

"There is great interest in 3-D printing of silicone rubber, or PDMS, which has a number of useful properties," said Velev, INVISTA Professor of Chemical and Biomolecular Engineering at NC State. "The challenge is that you generally need to rapidly heat the material or use special chemistry to cure it, which can be technically complex.

"Our method uses an extremely simple extrudable material that can be placed in a 3-D printer to directly prototype porous, flexible structures - even under water," Velev added. "And it is all accomplished with a multiphasic system of just two materials - no special chemistry or expensive machinery is necessary. The 'trick' is that both the beads and the liquid that binds them are [silicone](#), and thus make a very cohesive, stretchable and bendable material after shaping and curing."

More information: Sangchul Roh et al, 3D Printing by Multiphase Silicone/Water Capillary Inks, *Advanced Materials* (2017). [DOI: 10.1002/adma.201701554](https://doi.org/10.1002/adma.201701554)

Provided by North Carolina State University

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