Scientists construct high-strength microtube by coaxial printing with customized biohybird hydrogel ink

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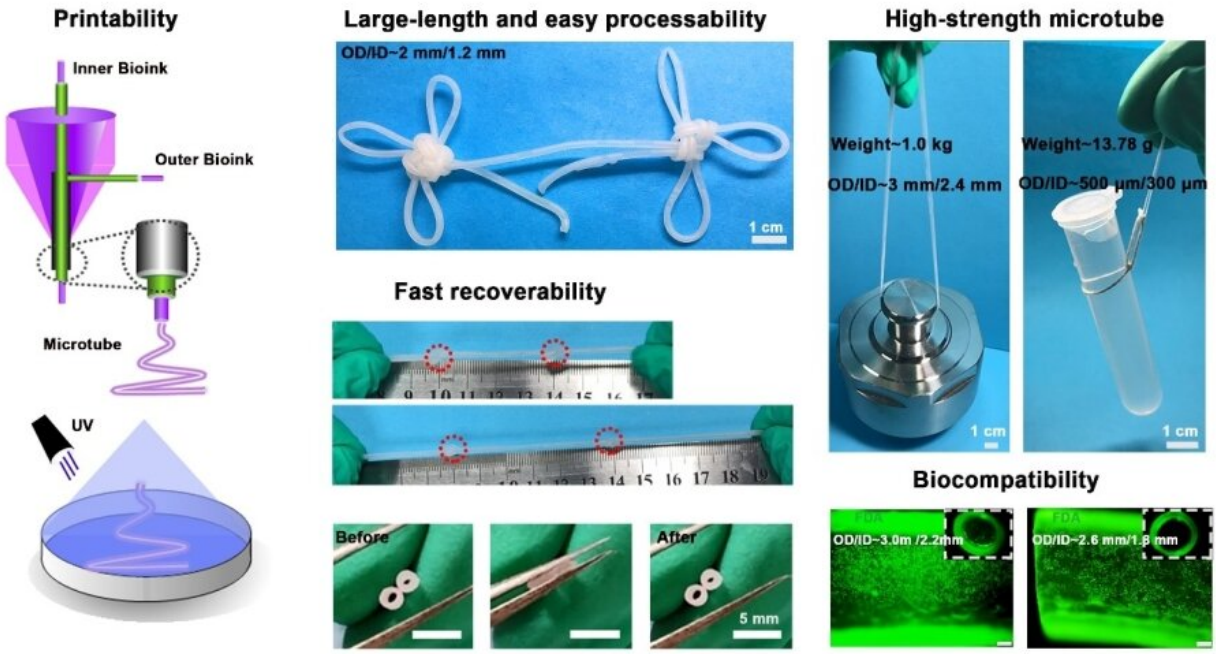

Schematic diagram of the fabrication and characterization of microtubes. Credit: SIAT

Coaxial extrusion printing has been developing toward generating microtubes for mimicking tubular tissues these years. However, generated microtubes with insufficient mechanical properties and their uncontrollable, inherent swelling attribute hinder their use as load-

bearing tubular tissue.

Recently, a research team led by Dr. Ruan Changshun from the Shenzhen Institutes of Advanced Technology (SIAT) of the Chinese Academy of Sciences constructed a high-strength microtube by coaxial printing with a customized biohybird hydrogel ink (CNG ink).

The biohybird hydrogel ink is consisted of nanoclay, H-bonding monomer N-acryloyl glycinamide and gelatin methacryloyl. Thanks to the coexistence of physical interpenetration, chemical crosslinks and reversible N-acryloyl glycinamide (NAGA) hydrogen bonding interactions, it demonstrated excellent printability and self-supporting property.

Moreover, the ink could be printed into microtube continuously and stably with a long length and tunable diameter simply by regulating external/internal needle size in the coaxial nozzle. This strategy is suited for scale-up production of microtubes with variable diameters.

The CNG hydrogel microtubes demonstrated swelling stability, high toughness, ultra-stretchability, compression resistance, rapid self-recovery property, excellent perfusion as well as controllable permeation.

Additionally, they exhibited excellent biocompatibility and accelerated endothelialization, suggesting their potential as tubular tissue grafts.

The study, published in *Advanced Functional Materials*, opens up a universal and facile method for scale-up fabrication of high-strength microtubes with huge potential in regeneration of tube-like tissues.

More information: Qingfei Liang et al. Coaxial Scale-Up Printing of Diameter-Tunable Biohybrid Hydrogel Microtubes with High Strength,

Perfusability, and Endothelialization, *Advanced Functional Materials* (2020). DOI: 10.1002/adfm.202001485