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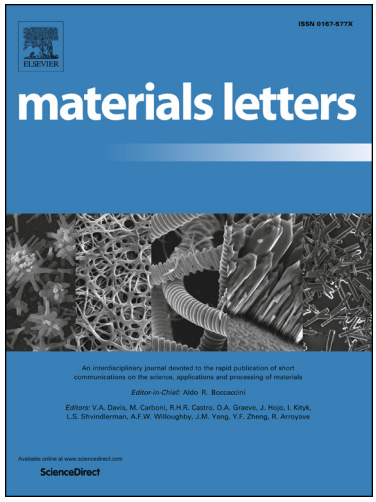

In situ synthesis of conductive nanocrystal cellulose/polypyrrole composite hydrogel based on semi-interpenetrating network

Yuqi Li, Hui Zhang, Shuzhen Ni, Huining Xiao

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In situ synthesis of conductive nanocrystal cellulose/polypyrrole composite hydrogel based on semi-interpenetrating network

Yuqi Li,[a] Hui Zhang,[b, c] Shuzhen Ni [c] and Huining Xiao [c,*]

[a] College of Ecological Environment and Urban Construction, Fujian University of Technology, Fuzhou 350108, China

[b] College of Materials Engineering, Fujian Agriculture and Forestry University, Fuzhou 350002, China.

[c] Department of Chemical Engineering, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada

[*]E-mail: hxiao@unb.ca

Abstract

A novel conductive composite hydrogel (PPy/NCC-g-AA) was fabricated via an in-situ oxidative polymerization of pyrrole monomer (Py) into a three-dimensional (3D) framework of acrylic acid (AA) grafted nanocrystal cellulose hydrogel (NCC-g-AA). Due to the high stability of the semi-interpenetrating network structure originating from PPy and NCC-g-AA hydrogel, the mechanical strength of the composite hydrogel was significantly enhanced, with the compressive modulus increasing from 0.23 to 4.16 MPa. The introduced carboxyl groups of AA enabled the hydrogel with improved water retention capacity (swelling ratio up to 910%). By doping with sodium p-toluenesulfonate (TsONa), the hydrogel showed much higher electrical conductivity (up to 8.8×10^{-3} $S\cdot cm^{-1}$) than that of undoped. This hydrogel is a promising candidate for applications in catalyst supports, nerve regeneration and carbon capture.

Keywords: conductive hydrogel; NCC; semi-interpenetrating; polypyrrole