

Top-down Approach to Produce Protein Functionalized and Highly Thermally Stable Cellulose Fibrils

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© 2018 American Chemical Society. Protein-functionalized cellulose fibrils, having various amounts of covalently bonded proteins at their surface, were successfully extracted from the tunic of *Pyura chilensis* tunicates using successive alkaline extractions. Pure cellulose fibrils were also obtained by further bleaching and were used as reference material. Extraction yields of protein-functionalized cellulose fibrils were within the range of 62-76% by weight based on the dry initial tunic powder. Fourier-transform infrared and Raman spectroscopy confirmed the preservation of residual protein at the surface of cellulose fibrils, which was then quantified by X-ray photoelectron spectroscopy. The protein-functionalized cellulose fibrils were found to have relatively high crystallinity and their cellulose I crystalline structure was preserved upon applying alkaline treatments. The extracted cellulosic materials were found to be constituted of fibrils having a ribbon-like morphology with width