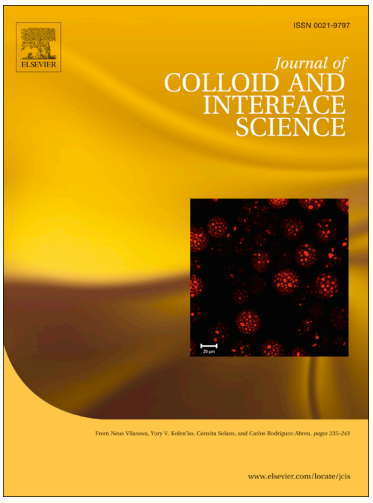

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Temperature-Responsive Nanogel Multilayers of Poly(N-vinylcaprolactam) for Topical Drug Delivery

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Abstract

We report nanothin temperature-responsive hydrogel films of poly(N-vinylcaprolactam) nanoparticles (νPVCL) with remarkably high loading capacity for topical drug delivery. Highly swollen $(\nu PVCL)_n$ multilayer hydrogels, where n denotes the number of nanoparticle layers, are produced by layer-by-layer hydrogen-bonded assembly of core-shell PVCL-co-acrylic acid nanoparticles with linear PVPON followed by cross-linking of the acrylic acid shell with either ethylene diamine (EDA) or adipic acid dihydrazide (AAD). We demonstrate that a $(\nu PVCL)_5$ film undergoes dramatic and reversible swelling up to 9 times its dry thickness at pH=7.5, indicating 89 v/v % of water inside the network. These hydrogels exhibit highly reversible ~3-fold thickness changes with temperature variations from 25 to 50 ºC at pH=5, the average pH of human skin. We also show that a $(\nu PVCL)_{30}$ hydrogel loaded with was ~120 μg/cm^2 sodium

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