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Gelatin-based Porous Silicon Hydrogel Composites for the Controlled Release of Tramadol

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Abstract

In this work new porous silicon-based gelatin hydrogel composites were developed. Porous silicon microparticles (PSip) with average size of 3 µm and average pore dimensions of 50 nm were used as crosslinking agents. Thermally oxidized or aldehyde functionalized PSip were mixed with a gelatin biopolymer to obtain physically or chemically cross-linked hydrogel composites. The resulting hydrogel networks showed important property enhancements such as improved mechanical stiffness, higher hydrolytic stability, and swelling capability; attributed to the PSip capacity of producing multiple bonds within the hydrogel network. The gelatin composites were evaluated as drug delivery systems using tramadol (TR) as model drug. Kinetics studies showed a TR release up to 20 h for the physically produced composite and up to 30 h for the chemically produced when compared to the hydrogel controls (5 h). Cytotoxicity studies of oxidized and functionalized PSip