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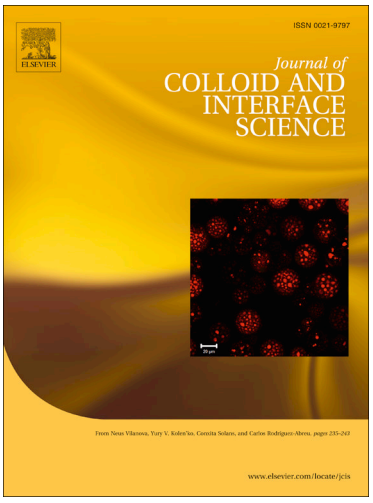

Halloysite nanotubes for efficient loading, stabilization and controlled release of insulin

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Halloysite nanotubes for efficient loading, stabilization and controlled release of insulin

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ABSTRACT.

Hypothesis: Oral insulin administration is not actually effective due to insulin rapid degradation, inactivation and digestion by proteolytic enzymes which results in low bioavailability. Moreover insulin is poorly permeable and lack of lipophilicity. These limits can be overcome by the loading of protein in some nanostructured carrier such as halloysite nanotubes (HNTs).

Experiments: Herein we propose an easy strategy to obtain HNT hybrid materials for the delivery of insulin. We report a detailed description on the thermal behavior and stability of insulin loaded and released from the HNTs hybrid by the combination of several techniques. *Findings:* Release experiments of insulin from the HNTs revealed the efficacy of the nanocarrier. Circular Dichroism data evidenced that the released insulin exhibits its native-like secondary structure confirming the suitability of HNT/insulin as delivery system for at least three months. The loaded nanotubes were filled into chitosan matrix with the aim to prepare bionanocomposite films that can be used for transdermal delivery. This work puts forward an efficient strategy to prepare halloysite based nanocarriers containing insulin that could be employed in several biomedical applications. The detailed description of the prepared HNT/insulin hybrid represents a fundamental point for designing advanced delivery systems.

KEYWORDS. Halloysite nanotubes, insulin, protein stability, sustained release, bionanocomposite hybrid.