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The application of halloysite tubule nanoclay in drug delivery

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Abstract

© 2016 Informa UK Limited, trading as Taylor & Francis Group. ABSTRACT: Introduction: Natural and biocompatible clay nanotubes are among the best inorganic materials for drug nanoformulations. These halloysite tubes with SiO₂ on the outermost surface have diameter of ca. 50 nm, length around 1 micrometer and may be loaded with drugs at 10-30 wt. %. Narrow tube openings allow for controllable sustained drug release for hours, days or even weeks. Areas covered: Physical-chemical properties of these nanotubes are described followed by examples of drug-loading capabilities, release characteristics, and control of duration of release through the end tube capping with polymers. Development of halloysite-polymer composites such as tissue scaffolds and bone cement/dentist resin formulations with enhanced mechanical properties and extension of the drug release to 2-3 weeks are described. Examples of the compression properties of halloysite in tablets and capsules are also shown. Expert opinion: We expect that clay nanotubes will be used primarily for non-injectable drug formulations, such as topical and oral dosage forms, cosmetics, as well as for composite materials with enhanced therapeutic effects. These include tissue scaffolds, bone cement and dentist resins with sustained release of antimicrobial and cell growth-promoting medicines (including proteins and DNA) as well as other formulations such as compounds for antiseptic treatment of hospitals.

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Keywords

Clay nanotubes, drug sustained release, halloysite tablets, nanosafety