

Halloysite Clay Nanotubes for Long Acting Controlled Release of Drugs and Proteins

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Abstract

© The Royal Society of Chemistry 2017. Tubule halloysite is a promising nanomaterial for functional clay composites. Not only does the addition of halloysite improve the mechanical properties of the composites, but the clay also has a hollow lumen that allows for functionalization of the matrix by the extended release and adsorption of practical molecules. Applications such as extended drug release, protein immobilization, anti-corrosion, and flame retardation are only some of the realized uses for this versatile nanotube. Molecules can be selectively adsorbed inside or outside of the tube by charge or by selective surface modification of the tubes. Various parameters such as calcination, pre-treatment with polymers, and acid-base selective etching can further extended the usefulness of the tubes by allowing minute control of porosity, adsorption capacity and release kinetics. On average, a molecule can be loaded at 5-15% (w/w) efficiency and released over a period of hours to days without any treatment. By adding stoppers to the tubes or embedding them into polymeric matrix, release can often be extended to weeks or months. The tubes are also biocompatible which enables their use in biomedical applications.

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