Study of cyclodextrin nanotubes by transmission electron microscopy

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The synthesis of cyclodextrin (CD) nanotubes has been first described by Harada in 1993[1]. Since then, few studies[2] have been reported concerning the synthesis and the characterization of these macromolecular structures by classical methods such as NMR^{1}H, SEC and mass spectrometry[3]. Today, considering the progress made in microscopy, the analysis of these synthetic structures is conceivable with a resolution around the nanometer scale[4]. This study focuses on the characterization of several nanotubes obtained from two kinds of poly(ethylene oxide) (PEO) chains of variable length and polymolecularity, in order to check if the controlled synthesis of these nanotubes is affected by the choice of these parameters. The transmission electron microscopy analysis was used to confirm the presence of CD nanotubes and to verify if the number of CDs counted on the nanotubes matched with the theoretical values. Indeed the high resolution of the pictures enabled to determine the number of CDs for each nanotube syntheses. This study by transmission electron microscopy permitted to demonstrate that the synthesis pathway chosen for the formation of the CD nanotubes is at the origin of the control of their structural parameters, and thus their properties. These synthetic nanotubes can lead to electrophysiology and cytotoxicity studies.

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