Highly-loaded Silver Nanoparticles in Ultrafine Cellulose Acetate Nanofibrillar Aerogel

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A facile method was developed to load a large amount of silver nanoparticles into a biodegradable and biocompatible cellulose acetate (CA) nanofibrillar aerogel in a controlled manner. The micro-sized CA fibrils were separated into nano-sized fibrils by salt-assisted chemical treatment in a water-acetone co-solvent to give a nanofibrillar structure with a diameter of 20-50 nm, BET surface area of 110 m^2/g, and porosity of 96 %. Using the high electron-rich oxygen density in the CA macromolecules and the large surface area of the CA nanoporous structure as an effective nanoreactor, the in-situ direct metallization technique was successfully used to synthesize Ag nanoparticles with an average diameter of 2.8 nm and a loading content of up to 6.98 wt%, which can hardly be achieved by previous methods. This novel procedure provides a facile and economic way to manufacture Ag nanoparticles supported on a porous membrane for various biomedical applications.