Spontaneous Formation of Noble Metal Nanosturctures Using Catechol-grafted Polymer Nanofibers

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초 록: Catechol moiety has enough reducing capability of reducing metal ions. Catechol-grafted polymer is chemically synthesized and electrospun into nanofibers as templates for metal nanostructures. The metal nanostructures are spontaneously generated on the catechol-grafted polymer nanofibers under ambient conditions.

1. 서론

Electrospinning is widely used to produce highly porous nanofiber structures. Recently the functionalization of electrospun nanofibers is a significant issue, and there has a need to a new technique for surface modification of porous nanofiber structures.

2. 본론

We introduce a facile method to synthesize noble metal nanostructures using catechol-grafted polymer nanofibers. The formation of metal nanostructures is driven by the oxidation of catechol moiety that has enough reducing capability of reducing metal ions. 3,4-dihydroxyhydrocinnamic acid is chemically grafted poly(vinylalcohol) (PVA) using ethylenediamine as a linker, producing catechol-grafted PVA (PVA-*g*-ct). Metal ions (e.g., Ag^{+}, Au^{3+} and Pt^{4+}) are spontaneously reduced to metal nanoparticles by incubation with PVA-*g*-ct solution in water. PVA-*g*-ct is electrospun into nanofibers, and the prepared PVA-*g*-ct nanofibers are used as templates for metal nanostructures. The synthesis and assembly of metal nanoparticles are spontaneously generated on PVA-*g*-ct nanofibers by incubation with metal ion precursor solution under ambient conditions. The highly rough metal nanostructures are generated with the nanofiber templates by a calcination process.

3. 결론

This facile synthesis generates metal nanoparticles and unique metal nanostructures with three dimensional porous structures that can be used for a wide range of applications such as biosensors, catalytic systems, electronic and optical devices.

참고문헌

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