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Silver Nanoparticles Deposited on the Single-Walled Carbon Nanotubes by Simple Electroless Plating Method

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Carbon nanotubes (CNTs) have attracted much attention from both physical and chemical view since their discovery. Recently, it has been reported that CNTs as supports for cathode catalysts in a fuel cell produced enhanced electrocatalytic activity and cell performance. In the previous work, however, intrinsic property of CNTs could be disrupted because the process of metal deposition including oxidation step makes fatal damage on the surfaces of CNTs. Moreover, in this process, specific metal deposition on the CNTs is limited because the rate of deposition on CNTs is the same as that in the reaction solution due to non-catalyzed sites of CNTs. In this work, only Sn ions was used on sensitization and activation for the deposition of silver nanoparticles on the single-walled carbon nanotubes (SWCNTs).

SEM, TEM, and XPS were conducted to study for deposition of silver nanoparticles on surface of SWCNTs. The deposition of metal silver nanoparticles was accomplished using only Sn ions for activation of non-oxidized SWCNTs. Sensitization and activation on the non-oxidized SWCNTs could be achieved due to electrophilic attack of an electropositive $Sn^{2+}(OCOCF3)_2$ species, non-hexagonal regions and defects of SWCNTs. Silver nanoparticles were deposited broadly and randomly on the sidewalls of SWCNTs. This results promise the decoration of other noble metals such as platinum, ruthenium, and palladium on the surface of CNTs.