Functionalization of Silver Nanowire Transparent Electrodes with Two-Dimensional Oligoglycine Tectomers

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Silver nanowire (AgNWs) networks combine high optical transmission with low sheet resistance that, together with their decreasing cost and large-scale manufacturing methods, make them perfect candidates as replacement materials of Indium Tin Oxide (ITO) for transparent electrode applications, as well as for platforms with potential applications in bio-sensors and bio-engineering [1]. On the other hand, amine-terminated oligoglycines self-assemble into unique two-dimensional nanostructures called tectomers. The exceptional structural features and surface chemistry of tectomers have already been successfully used to coat negatively-charged surfaces, and biological membranes, and have promising potential in the field of antiviral application [2]. Previously we reported that tectomers efficiently act as pH-responsive nanocarriers [3], and showed, for the first time, that tectomers strongly interact with graphene oxide and carboxylated carbon nanotubes [4], and with a variety of other carbon nanomaterials and functionalized nanoparticles [5], offering promise for a range of technological applications and in electronic- and smart textiles [4,5].

We here report on the fabrication of AgNW/tectomer peptidic nanohybrids by coating transparent AgNW electrodes with thin tectomer films. Tectomer platelets strongly interact with AgNWs using the interactions between amino groups and silver atoms, and mechanically compress AgNW networks, leading to the formation of transparent hybrid electrodes with remarkably enhanced electrical conductivity. Tectomer coatings impart moisture protection to AgNW electrodes, preventing electrode degradation upon exposure to atmospheric conditions [5]. The hybridization of AgNW with these unique peptide assemblies creates tremendous opportunities in extending the applications of transparent electrodes in new directions, ranging from sensing to nanoscale electronics to hybrid functional materials [6].

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