

Bio-templated synthesis of TiO₂ coated gold nanowire for perovskite solar cells

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Supporting Information

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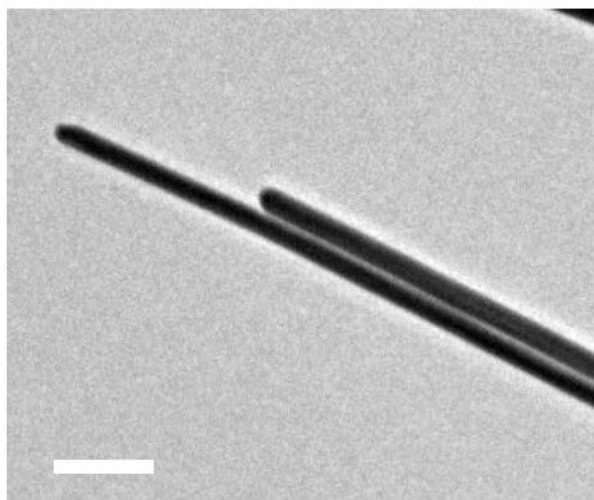


Figure S1. TEM image of a mixture of GNW and Dps. The sample was analyzed with 3% PTA stain. Dps could not bind the surface of GNW. The scale bar is 200 nm.

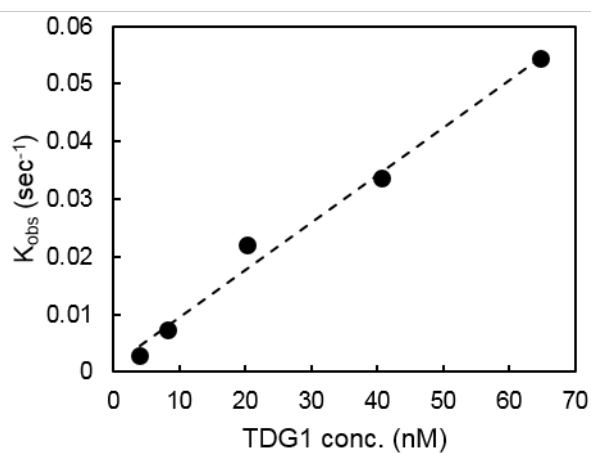


Figure S2. Gold binding activity of TDG1. The changes in resonance frequency of QCM were measured as a function of time after the addition of TDG1 to gold sensor. The graph shows the correlations between the concentrations of TDG1 and k_{obs} .

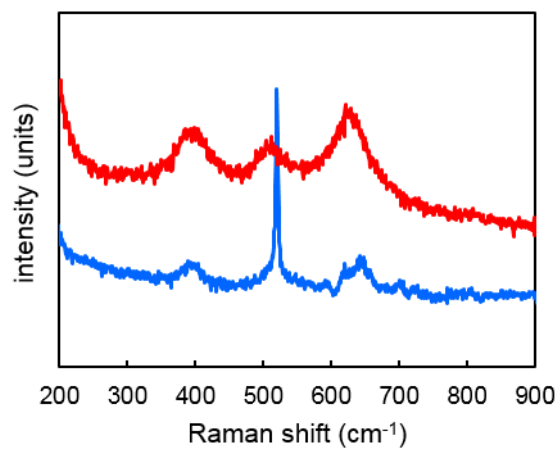


Figure S3. Raman spectrums of a TiO_2 layers. The TiO_2 layers deposited on Si-plate by minTBP1 were annealed at 100 °C (blue line) or 200 °C (red line). The peaks at 400 cm^{-1} , 510 cm^{-1} and 630 cm^{-1} are attributed to anatase- TiO_2 . The sharp peak at 520 cm^{-1} in blue line due to the Si-plate.

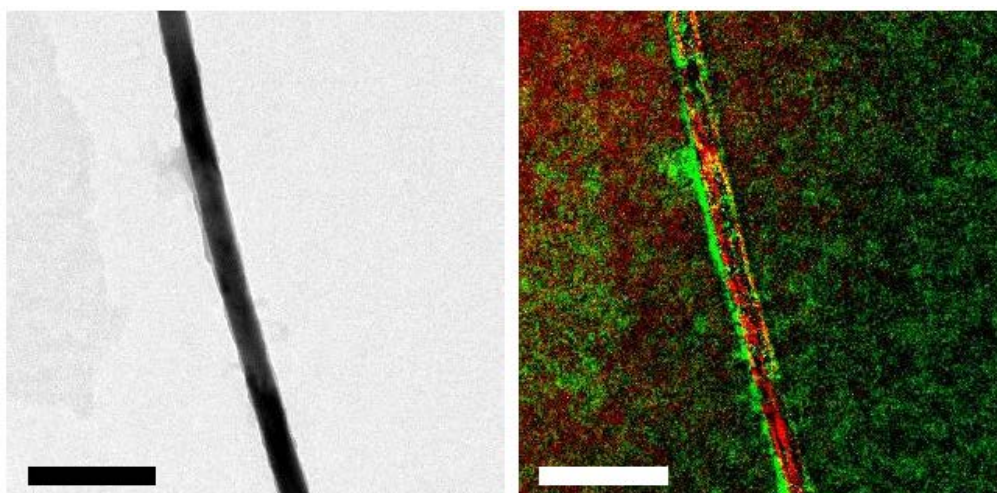


Figure S4. (a) TEM image and (b) EDS mapping of the nanowire. A layer containing titanium (green) was detected around the fibrous structure containing gold (red). The scale bars are 200 nm.

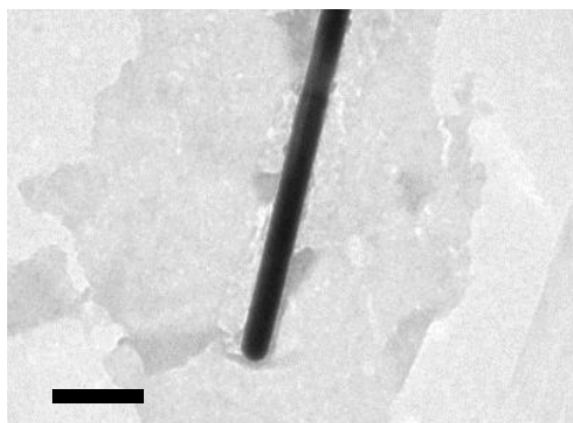


Figure S5. TEM image of a GNW mixed with titanium precursor. The titanium-compound GNW conjugate could not be obtained.

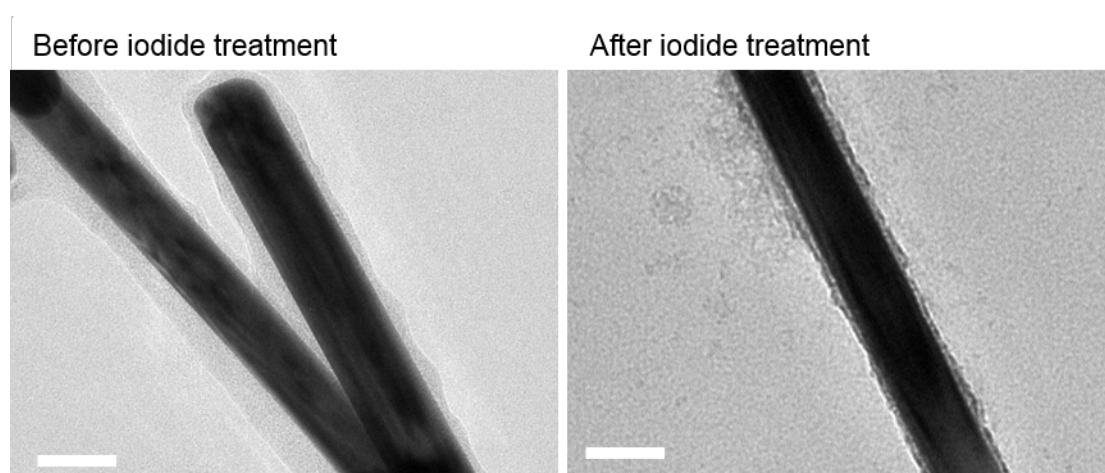


Figure S6. Stability of a TiO_2 coated Au-nanomaterial in iodide solution. TiO_2 coated gold nanowires were incubated in iodide solution (10% Iodolyte AN-50. The AN-50 containing 10-25% 1,2-dimethyl-3-propylimidazolium iodide, 2.5-10% iodine in acetonitrile, was purchased from Solaronix SA, Switzerland) for 0.5 hours. The samples were analyzed without stain. No change of Au-NPs sizes confirmed before and after incubation in iodide solution. The scale bars are 50 nm.

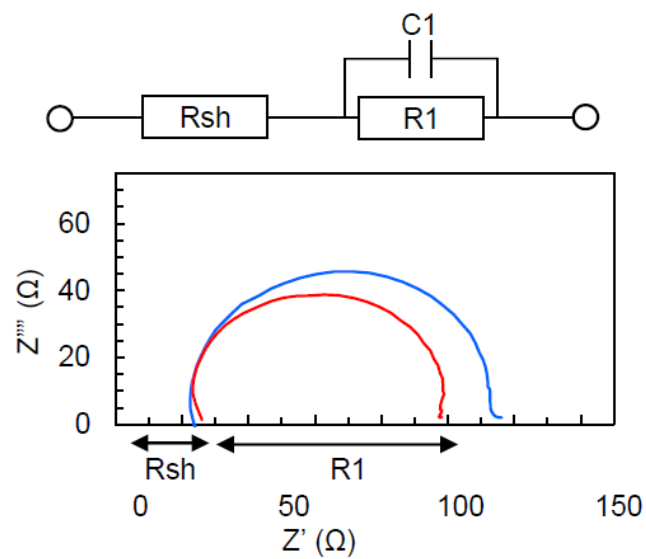


Figure S7. Electrochemical impedance spectra (EIS) of PSCs with the nanowire. A solid red line indicates EIS of cells based on TiO_2 electrode with 0.3 wt% TiO_2 -coated GNW. The blue line indicates EIS of the conventional cells with 150 nm thickness TiO_2 electrode.