Supporting Information

Surface-Specific Deposition of Catalytic Metal Nanocrystals on Hollow Carbon Nanospheres *via* Galvanic Replacement Reactions of Carbon-Encapsulated MnO Nanoparticles

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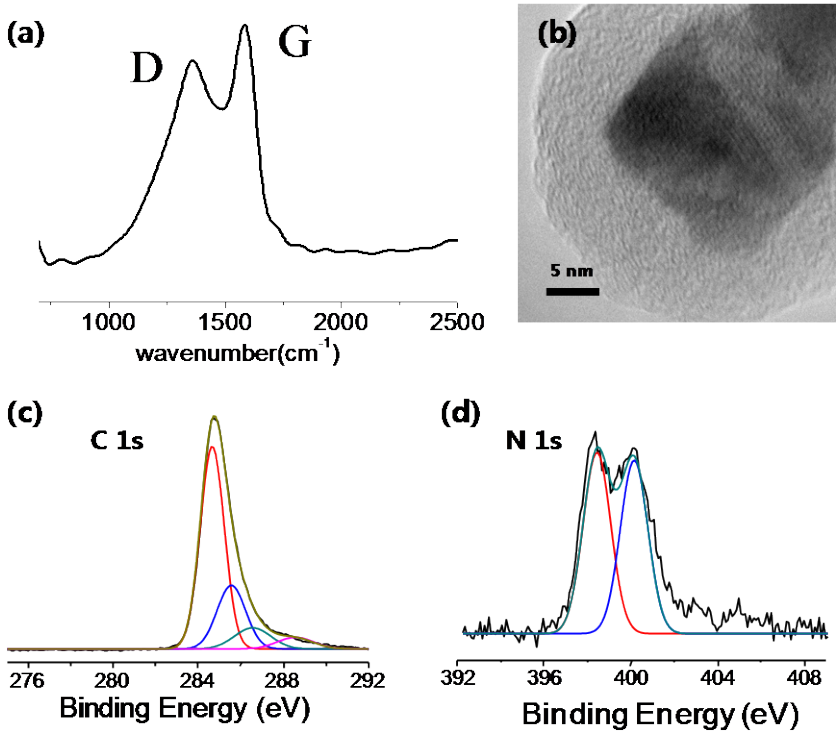

Figure S1. (a) Raman spectrum, (b) HRTEM image, XPS spectra of the **MnO@C** which were deconvoluted into (c) four componet peaks correspong to C 1s electron in C=C (284.6 eV), C-C or C-N (285.5 eV), and C=N (286.5 eV), and C (bezene)-N (288.6 eV) bonds, respectively and (d) two componet peaks corresponding to N 1s electron in C=N (398.5 eV) and C-N (400.2 eV) bonds.

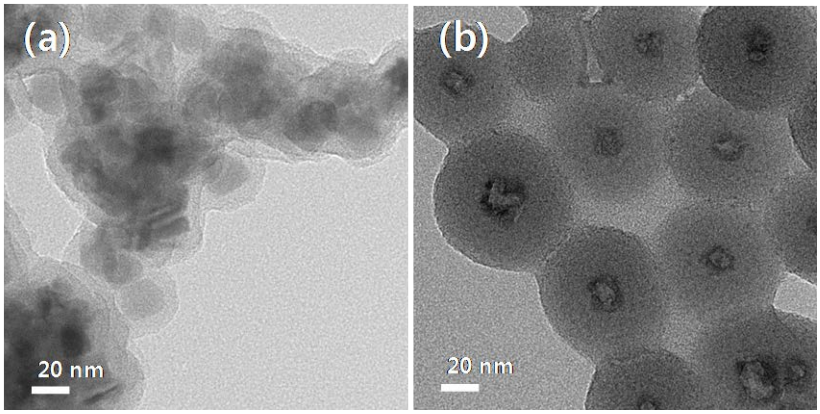

Figure S2. TEM images of the samples obtained after treating (a) **MnO@C**, (b) **MnO@SiO$_2$** in an acidic solution of pH 1.4 at room temperature for 24 h. When the MnO@Mn_3O_4 nanoparticles were treated in a same condition, the nanoparticles were fully dissolved therfore any solid was not precipitated by the centrifugation.

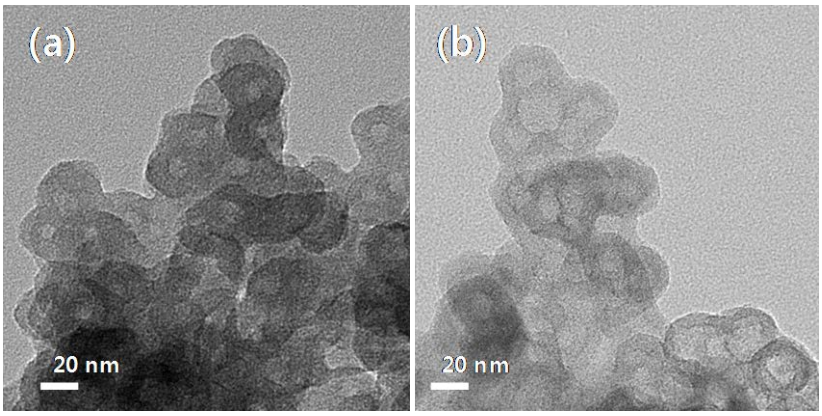

Figure S3. TEM images of the samples after treating **HCNS**, which was prepared by etching the MnO core from **MnO@C**, with Na_2PtCl_4 (a) in an aqueous solution of $MnCl_2$ and (b) in a supernatnat solution obtained by dissolving MnO core from the **MnO@C** in an HCl.

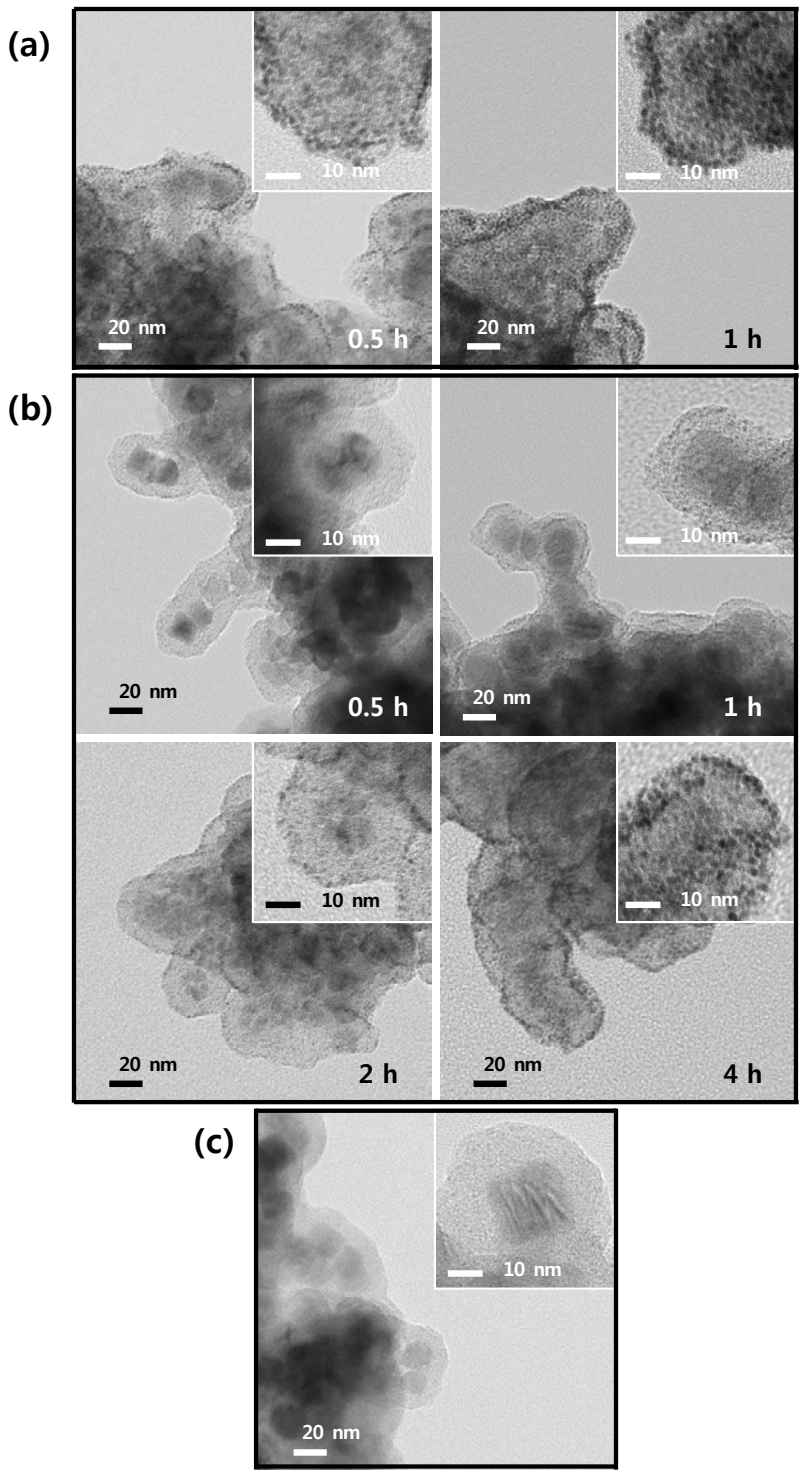

Figure S4. TEM and HRTEM (inset) images of samples obtained by treating the **MnO@C** in a Na_2PtCl_4 solution at (a) 70 °C, (b) 50 °C, and (c) room temperature.

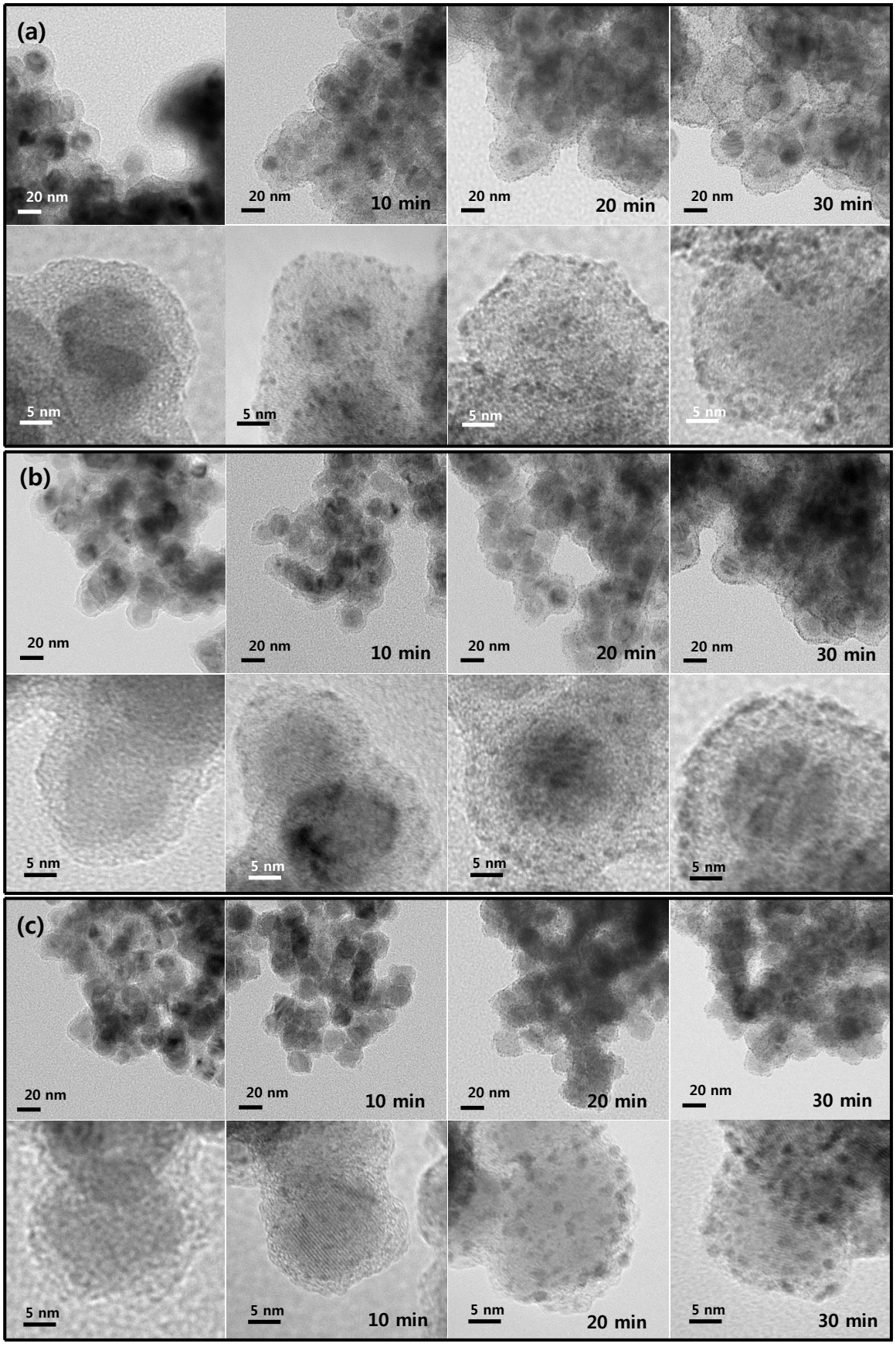

Figure S5. Time course TEM and HRTEM images of samples obtained by treating the **MnO@C**, having (a) 7.6 (± 0.9) nm, (b) 4.9 (± 0.4) nm, and (c) 3.1 (± 0.3) nm of carbon shell thickness, in a Na_2PtCl_4 solution at 70 °C.

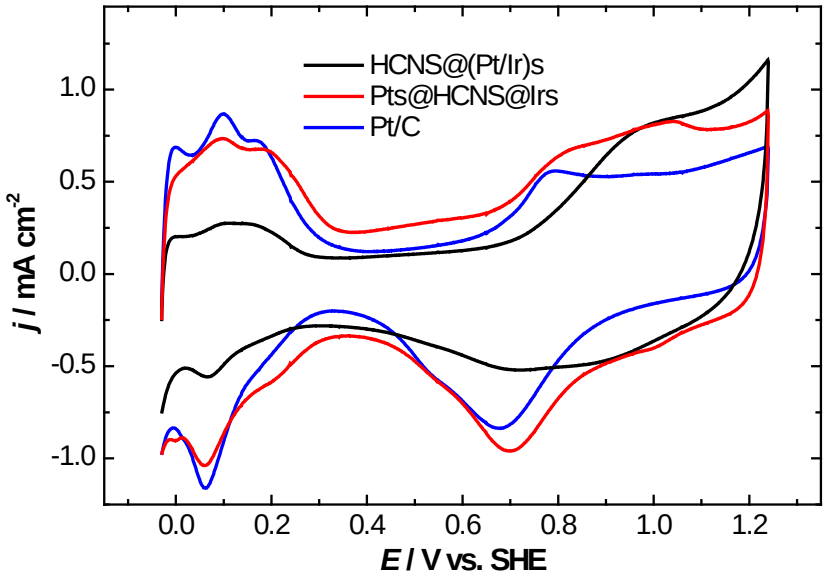

Figure S6. Cyclic voltammograms of three catalysts obtained in a 0.1 M $HClO_4$ solution saturated with N_2. Scan rate: 50 mV/s.