

Electronic Supplementary Information

**Impact of  $sp^2$  carbon material species on Pt nanoparticle-based  
electrocatalysts produced by one-pot pyrolysis methods with ionic liquids**

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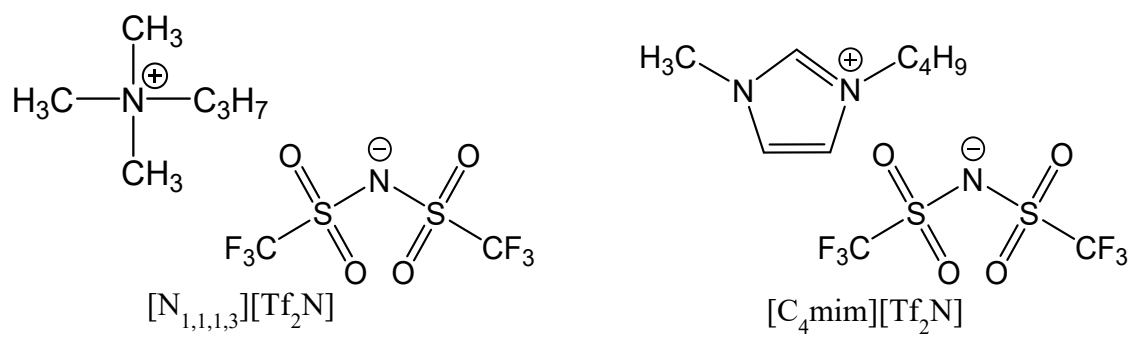
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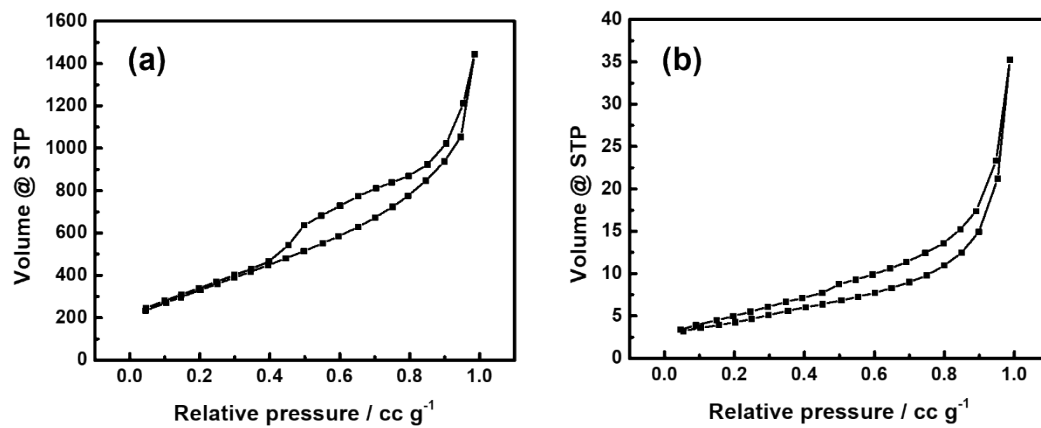
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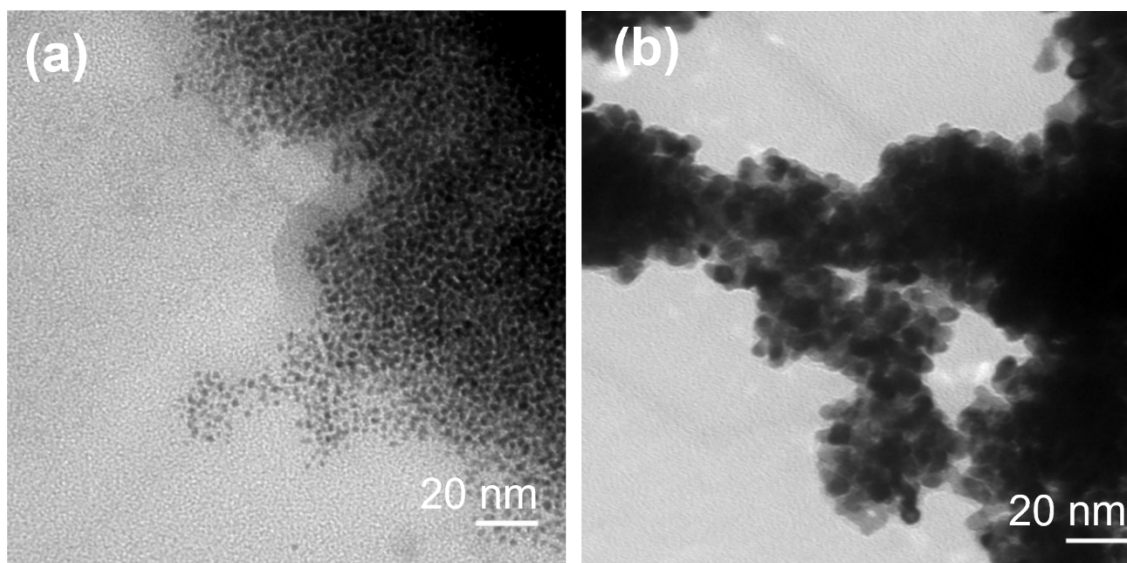
E-mail addresses: [ttsuda@chiba-u.jp](mailto:ttsuda@chiba-u.jp) and [kuwabata@chem.eng.osaka-u.ac.jp](mailto:kuwabata@chem.eng.osaka-u.ac.jp)



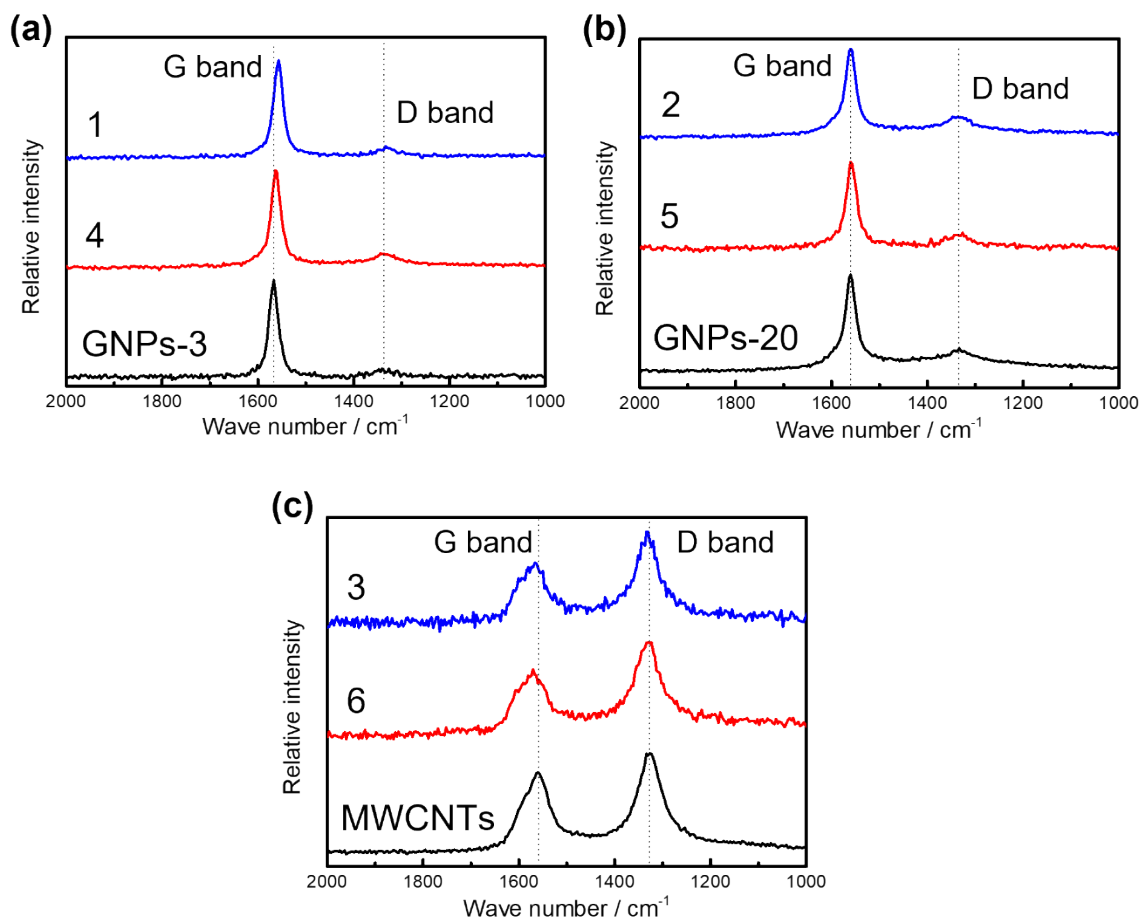
**Fig. S1** Chemical structural formulae of ionic liquids used in this study.



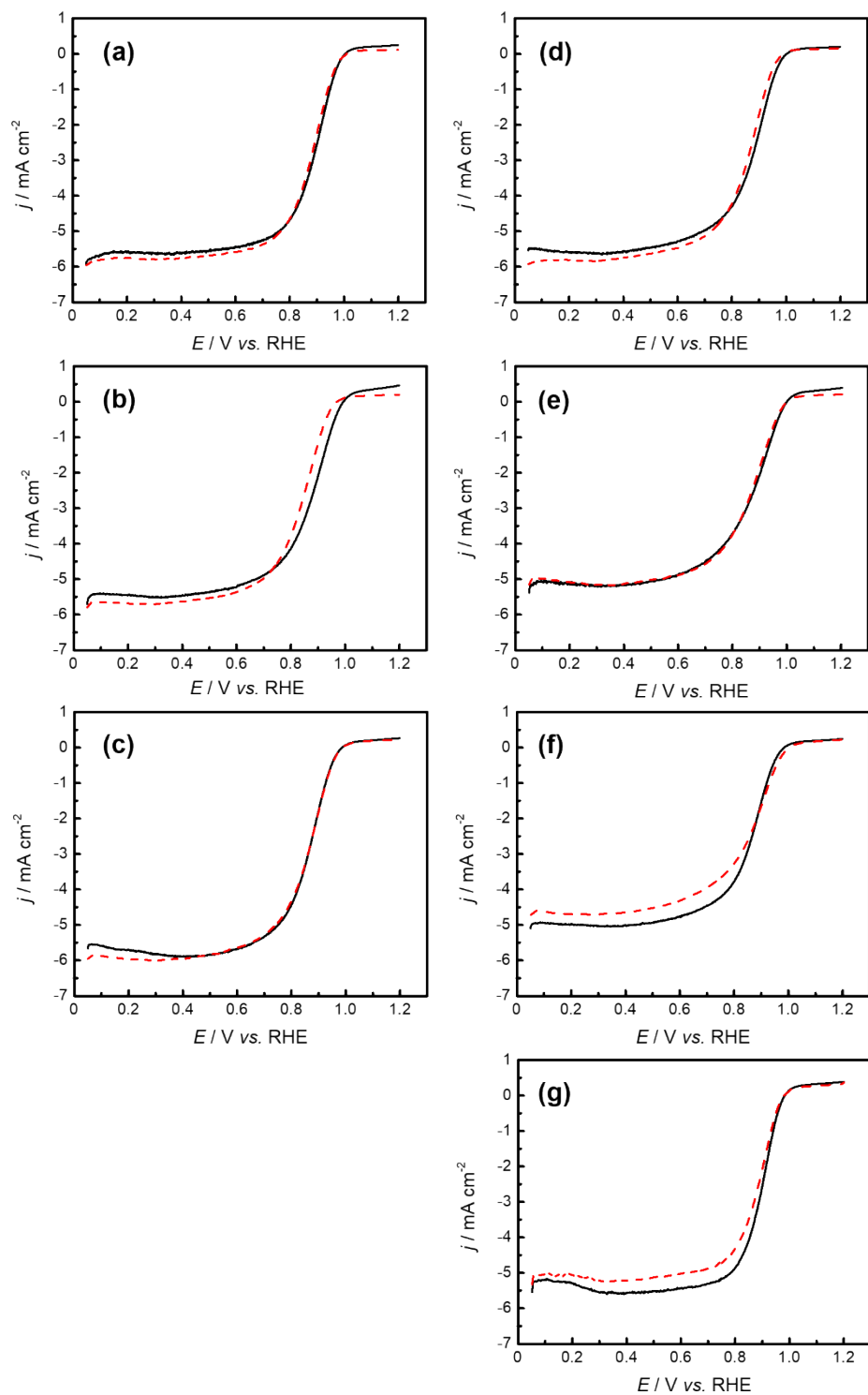
**Fig. S2** Nitrogen adsorption-desorption isotherms of (a) GNPs-3 and (b) MWCNTs. The BET specific surface areas of GNPs-3 and MWCNTs were estimated to be 1243 and 210 m<sup>2</sup> g<sup>-1</sup>, respectively.



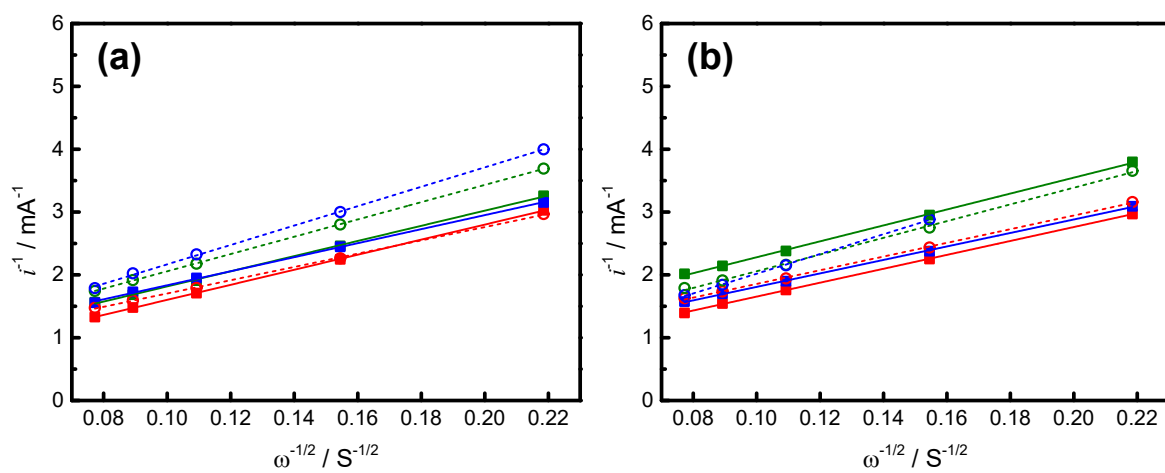
**Fig. S3** Transmission electron microscopy (TEM) images of Pt nanoparticles prepared under the same experimental conditions as given in Table 1, but without  $\text{sp}^2$  carbon materials. The ILs employed were (a)  $[\text{C}_4\text{mim}][\text{Tf}_2\text{N}]$  and (b)  $[\text{N}_{1,1,1,3}][\text{Tf}_2\text{N}]$ .



**Fig. S4** Raman spectra of specimens 1–6. The  $\text{sp}^2$  materials used in the IL one-pot pyrolysis method were (a) GNPs-3, (b) GNPs-20, and (c) MWCNTs. The ILs employed for this process were (blue)  $[\text{C}_4\text{mim}][\text{Tf}_2\text{N}]$  and (red)  $[\text{N}_{1,1,1,3}][\text{Tf}_2\text{N}]$ . (black) Original  $\text{sp}^2$  carbon material.



**Fig. S5** Linear sweep voltammograms recorded at glassy carbon stationary electrodes with specimens (a) **1**, (b) **2**, (c) **3**, (d) **4**, (e) **5**, (f) **6**, and (g) **Pt-C** in an  $\text{O}_2$ -saturated 0.1 M  $\text{HClO}_4$  aqueous solution (—) before and (---) after the durability test. The rotating speeds were 1600 rpm. The scan rate was  $10 \text{ mV s}^{-1}$ .



**Fig. S6** Koutecký-Levich plots (a) before and (b) after durability tests. The potential for constructing the plots was 0.85 V. (c) Variation in surface retention rate estimated from the Koutecký-Levich plots as a function of cycle number. The specimens are (■) 1, (■) 2, (■) 3, (○) 4, (○) 5, and (○) 6.