**Electronic Supplementary Information (ESI)**

**Facet Effects of Palladium Nanocrystals for Oxygen Reduction in an Ionic Liquid and Sensing Application**

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**Figure S1.** Cyclic voltammograms at different scan rate of (A) cubic palladium nanocrystals (B) RD palladium nanocrystals in [Bmpy][NTf2] with 0.01 M ferrocene (third cycle), the electrochemical active surface area for Pd{100} and Pd{110} is 32.49 cm2 and 37.49 cm2, respectively.

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**Figure S2.** SEM images of (A) RD, (B) Cubic Pd nanocrystals after 300 °C annealing.



**Figure S3.** Cyclic voltammograms of palladium nanocrystal electrodes in 0.1 M HClO4 solution after annealing treatment (third cycle), scan rate: 100 mVs-1 (potential vs. RHE).



**Figure S4.** Cyclic voltammograms of polycrystalline platinum electrodes in (solid) 21% v/v oxygen concentration, (dash) pure nitrogen (third cycle). Scan rate: 0.1 V/s.



**Figure S5.** Different scan rates of cyclic voltammograms for (A) cubic (B) RD Pd nanocrystals in [Bmpy][NTf2] at (10%, v/v) oxygen. Peak current vs. square root of scan rate plots for (C) cubic (D) RD Pd nanocrystal.



**Figure S6.** Charge ratio of oxygen redox peaks for two types of palladium nanocrystals in [Bmpy][NTf2] obtained in Figure 2A and 2B.

**Table S1**. The names and structures of ionic liquid and possible deprotonated cation structures

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| --- | --- | --- | --- |
| [NTf2]- |  | [Bmpy]+ |  |
| [Bmpy]de+ (1) |  | [Bmpy]de+(2) |  |