

## SUPPORTING INFORMATION

### *PAni synthesis on HOPG and Modified HOPG:*

An aqueous solution of 5.4 mM sodium dodecyl sulfate (SDS, 98% Aldrich Chemical Company, recrystallized once from 95% ethanol, cmc  $8.1 \times 10^{-3} \text{M}$ ), and 5.4mM aniline (99% Aldrich, distilled under reduced pressure) was prepared at pH 2 using HCl (ACS plus grade, Fisher Scientific). 1-dodecanol (98% Avocado Research Chemicals) was used as received. All solutions were prepared with  $18.2 \text{ M}\Omega\text{-cm}^{-1}$  nanopure water in polypropylene (PP) vessels, stirred at  $27 \pm 1^\circ\text{C}$  for 1 h and then used immediately. Although SDS was recrystallized once from 95% ethyl alcohol, almost certainly dodecanol remains as an impurity.<sup>i</sup> As low pH will also contribute to the hydrolysis of SDS, solutions were prepared and used in a timely manner to ensure reproducibility.

Advanced Ceramics, ZYB grade HOPG (12 x 12 mm) was cut into four pieces of approximately 5 x 5 mm on a band saw (ZYB grade HOPG was used to give a surface with fewer grain boundaries compared to ZYH HOPG. Thin sections of HOPG were cleaved with a razor blade exposing a fresh surface used for reaction. HOPG thin sections were not re-used for subsequent reactions because of contamination of underlying layers. Chemically modified HOPG was prepared by the treatment of a freshly cleaved graphite monochromator ZYB (5 mm x 5 mm Advanced Ceramics) with 5 mL of a 5.4 mM ammonium persulfate (APS, 98% Aldrich Chemical Company) at a pH of 2 adjusted with HCl for 3 hours at  $22 \pm 1^\circ\text{C}$  in a polyethylene (PE) vial. The block was then briefly rinsed with nanopure water and dried for at least 12 hours in a dessicator prior to use.

Graphite substrates were contacted with 5 mL of the SDS/aniline solution for 5 h at  $27 \pm 1^\circ\text{C}$  in PE vials. A final monomer/oxidant molar ratio of 1:1 was obtained by the addition of 100  $\mu\text{L}$  of an APS solution with stirring for approximately 5 minutes.<sup>ii</sup> Following polymerization, the substrate was rinsed thoroughly with pH 2 water (adjusted with HCl) and dried at room temperature in a dessicator for at least 12 h prior to imaging.

*PPy synthesis on HOPG:*

Sodium 1-octanesulfonate (99% Aldrich Chemical Company,  $\text{cmc } 1.6 \times 10^{-1} \text{M}$ ), sodium 1-decanesulfonate (98% Avocado Research Chemicals Ltd.,  $\text{cmc } 4.3 \times 10^{-2} \text{M}$ ) and sodium 1-dodecanesulfonate (99% Avocado Research Chemicals Ltd.,  $\text{cmc } 1.2 \times 10^{-2}$ ) were all used without further purification as were 1-octanol and 1-decanol (99% Avocado Research Chemicals Ltd.). Pyrrole (98% Aldrich Chemical Company) was filtered through a basic alumina column prior to use. 5.4/2.7 mM surfactant/pyrrole solutions were used in all cases prepared with  $18.2 \text{ M}\Omega\text{-cm}^{-1}$  nanopure water in PP vessels. A fresh surface of HOPG was rendered by cleaving a thin section of graphite monochromator ZYH (5 mm x 5 mm Advanced Ceramics) as described previously. HOPG substrates were then contacted with 5 mL of the surfactant/pyrrole solution for 2 h at  $22 \pm 1^\circ\text{C}$  in PE vials. A final monomer/oxidant molar ratio in of 1:1 was obtained by addition of 100  $\mu\text{l}$  of an APS solution with stirring for approximately 5 minutes,<sup>ii</sup> and oxidation carried out at  $22 \pm 1^\circ\text{C}$  for 2 h. Following polymerization, the substrate was rinsed thoroughly with nanopure water and dried in a dessicator at room temperature for at least 12 h prior to imaging.

### *AFM Imaging*

AFM images were collected by a Digital Instruments NanoScope III microscope, operated in tapping mode. MikroMasch Ultrasharp silicon nitride cantilevers were used with a backside aluminum coating and typical resonant frequencies of 325 kHz and force constants of 40 N/m. All scanning was performed under ambient conditions with typical relative humidity levels of around 30%. Images shown in Fig. 2 were captured at a scan angle of 0° with minimal engagement forces and relatively high scan rates (~15 µm/s). The wires appeared soft and easily distorted by lower setpoints. All other images were collected at a scan angle of 0° and tip velocities of ~3 µm/s. No filtering of images was performed. Calibration of the AFM was carried out using grids with a pitch of 10 µm and depth of 180nm.

### *XPS Experiments*

XPS data were recorded on a Physical Electronics PHI 5800 ESCA System with a background pressure of approximately  $2.0 \times 10^{-9}$  Torr. The electron takeoff angle was 45° with respect to the sample surface. An 800 µm spot size and 23 eV pass energy were typically used for the analysis. Binding energies were corrected by reference to the C<sub>1s</sub> line at 284.8 eV for hydrocarbon. A nonlinear Shirley-type background was used for the area analysis of each peak. XPS data was fitted with Voigt Amplitude curves using PeakFit<sup>®</sup> software from Systat Software.

### REFERENCES

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i Turner, S. F.; Clarke, S. M.; Rennie, A.R.; Thirtle, P.N.; Cooke, D. J.; Li, Z. X.; Thomas, R. K. Langmuir, **1999**, 15, 1017.

ii Gentle stirring to ensure that color changes occurring during synthesis were homogeneous.