Electronic Supplementary Material (ESI) for RSC Advances

Supporting Information

A hybrid electrochemical/chemical synthesis of polyaniline film on Au electrode

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S1. AFM Study:

The AFM imaging was carried out using a Nanosurf easyScan 2 (Nanosurf AG, Switzerland) atomic force microscope in the tapping mode and phase contrast mode. The NCLR (Nano World) tip with force constant 48 N m^{-1}, resonant frequency 190 kHz and tip radius of about 8 nm was used.

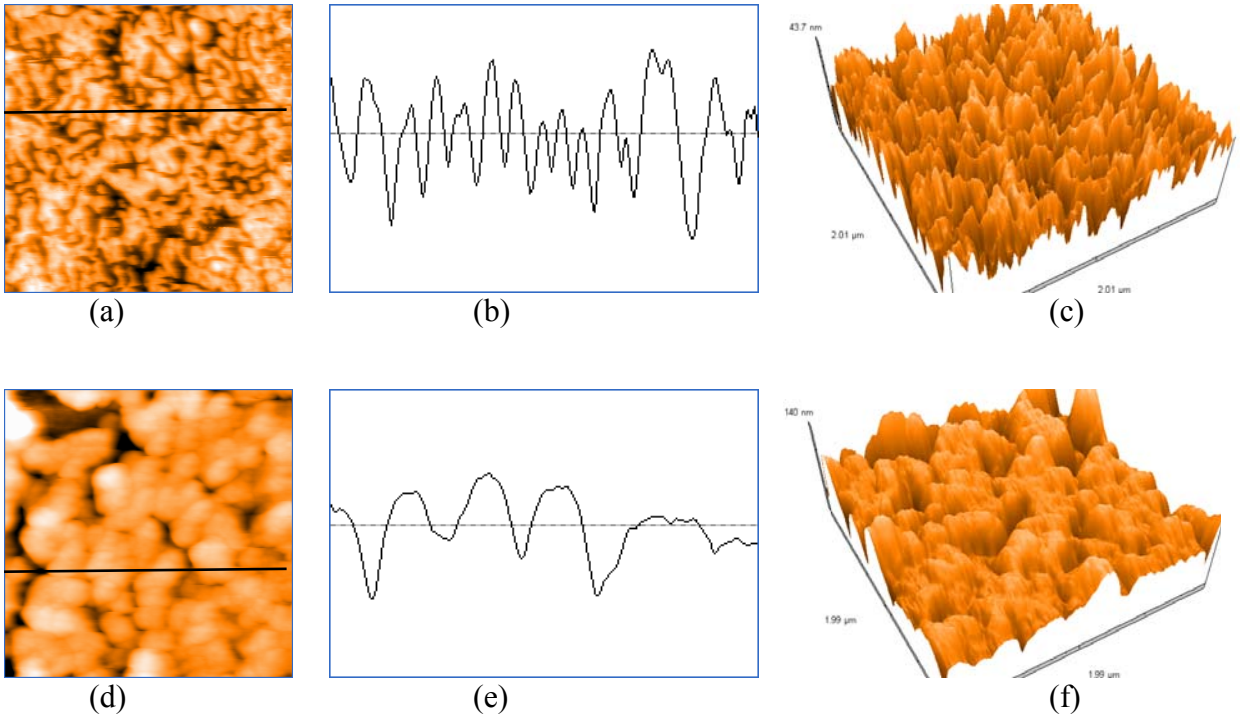

Figure S1 Topographic AFM images of (a) gold oxide (d) PANI/Au. Height profile of (b) gold oxide (e) PANI/Au corresponding to black line on images (a) and (d), respectively. Three-dimensional AFM images of (c) gold oxide (f) PANI/Au. Scan size is 2 µm x 2µm.

Topographic images of gold oxide (Figure S1a) shows a porous surface with interconnected ligaments which form pores that are 50-150 nm in diameter. The polyaniline prepared on Au electrode (PANI/Au) (Figure S1d) by hybrid electrochemical/chemical method exhibits large granular/globular structure with diameter ranging from 180 to 320 nm. The numbers of pores has decreased, but the diameter has increased. PANI/Au has 3 times higher root-mean-square surface roughness than that of the gold oxide (scanned area 5 μm x 5 μm). Figure S1b and Figure S1e show the line graph (height-profile) of the gold oxide and PANI/Au, respectively. The sharp peaks in gold oxide were replaced by broader peaks in PANI/Au. It seems that the PANI film formed via the chemical oxidation of aniline by gold oxide might have covered the pores and ligaments on Au oxide.

S2. Electrochemical Study:

The mass of the PANI deposited on Au electrode is calculated from the charge (Q) under the redox peak for leucoemeraldine to emeraldine redox transition at slow scan rate. Leucoemeraldine to emeraldine redox transition in PANI involves 0.5 mole of electrons for one mole of aniline unit. The charge (Q) for leucoemeraldine to emeraldine redox transition was evaluated by integrating the anodic wave of the redox couple.

$$\text{mass of polyaniline} = \frac{2*91.1*Q}{96485.3}\ \text{g}$$