Supporting Information

Enzyme free glucose sensor exploiting a poly (dimethylaniline) grafted sulfonated ionomer- copper nanocomposite

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Section S1. Detailed explanation of SPEEK synthesis:

Sulfonation of PEEK was obtained by slow addition of dried powdered PEEK in conc. sulfuric acid by 10% (w/v) material to acid ratio at room temperature under constant stirring for 72h. The moisture contamination was rigorously excluded to ensure reproducibility of sulfonation level, which was found to be 61% by 1H NMR spectra and ion-exchange capacity studies. It was believed that the presence of moisture contamination renders the formation of pyrosulfonate intermediate to inter and intra-molecular sulfone crosslink. After the reaction, polymer was precipitated with at least five-fold volume of deionized water and shredded to obtain fine powder. This was then filtered and washed with water until the last trace of acidity was removed. [T.Chakrabarty, M. Kumar, K.P. Rajesh, V.K. Shahi, T.S. Natarajan, Sep.Pur.Technol.75 (2010) 174]

Section S2. Detailed explanation of FTIR spectra of SPEEK, DMA/SPEEK and PDMA/SPEEK:

FT-IR spectra of the SPEEK was found that the aromatic C-C stretching vibration was observed at 1599-1412 cm^{-1} with sharp to medium intensity, while the absorption at 3092-3006 cm^{-1} with medium intensity was attributed to aromatic C-H stretching vibration in SPEEK. In plane C-H deformation bands were observed at 1290-1000 cm^{-1}, and C-H out of plane bending at 955-845 cm^{-1}. Peaks at 2192-1788 cm^{-1} were characteristic of 1,2-disubstituted and 1,2,4-trisubstituted aromatic moiety. The adsorption band at 1729 cm^{-1} was attributed to the carbonyl group stretching vibration, and at 1024 cm^{-1} to O=S=O vibrations of sulfonic acid group. Few peaks with medium to sharp intensity for –OH group of $–SO_3H$ were observed at 3644-3392 cm^{-1}.

The absorption bands associated with the aromatic ring in plane skeletal deformation vibrations at 1601, 1510 and 1467 cm^{-1} .The band at 750 and 696 cm^{-1}, indicate that there is head to tail coupling in the polymers. Absorption bands around at 1321 and 1243 cm^{-1} are due to C-N stretching vibrations of tertiary amines of DMA/SPEEK , but in the PDMA/ SPEEK composite was observed in the higher–frequency region shifted to 1359 and 1269 cm^{-1} [L. Kravets, A.B Gilman and A. I. Drachev, High Energy Chem. 39 (2005) 114]. Observed band at 2850-3000 cm^{-1} indicated CH_3 groups of the composites. SPEEK exhibited characteristic absorption bands at 3450 cm^{-1} (assigned to OH vibration from sulfonic group interacting with molecular water), 1633 cm^{-1} (a carbonyl absorption band), and 1050-1080 cm^{-1} (sulfur–oxygen (O=S=O) symmetric vibration) [P. Xing, G.P. Robertson, M.D. Guiver, S.D. Mikhailenko, K. Wang and S. Kaliaguine, J. Membr. Sci. 229 (2004) 95]

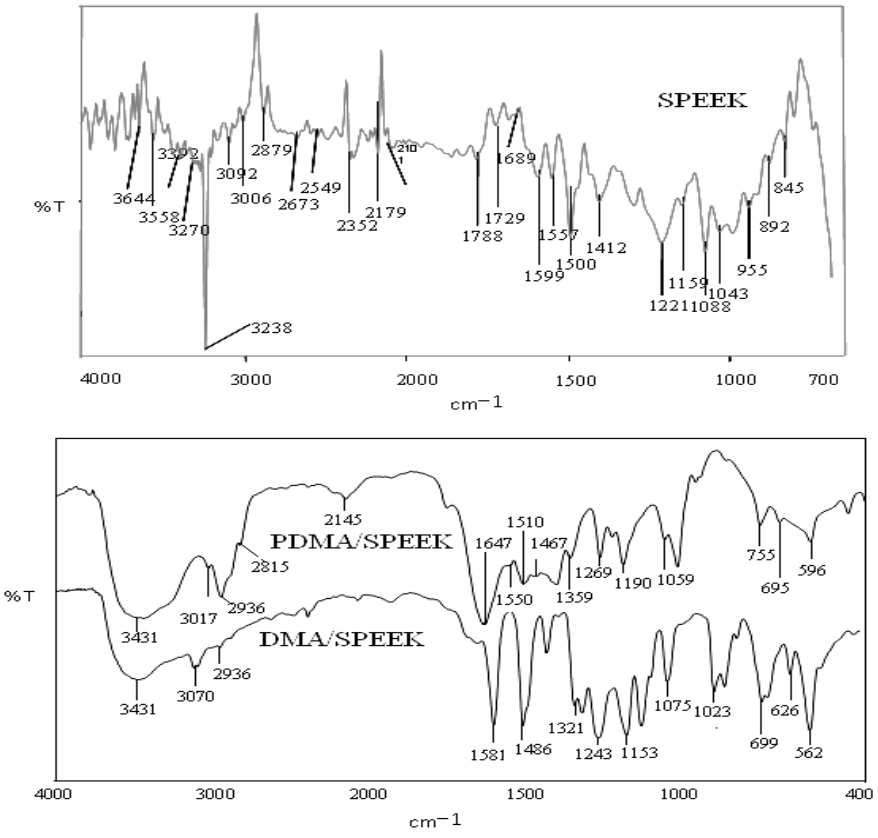

Fig. S1. The FTIR spectra of SPEEK, DMA/SPEEK, and PDMA/SPEEK.

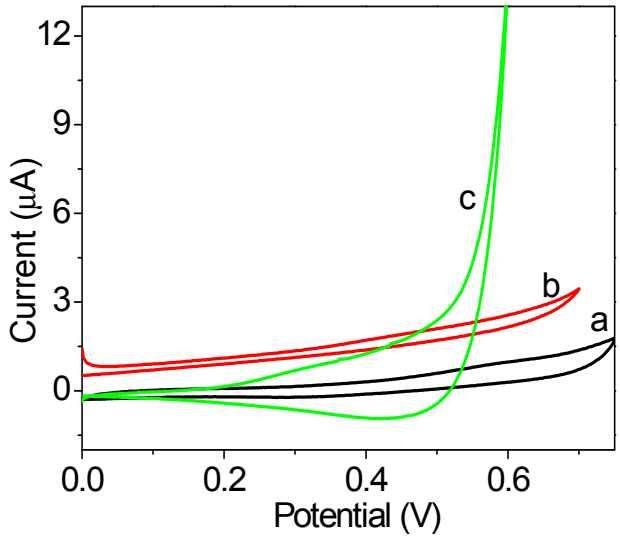

Fig. S2. CVs of SPEEK/PDMA/CuNFs/GCE for 1mM glucose oxidation in different media a) 0.1 M HCl, b) 0.1 MPBS (pH7) and (c) 0.1 M KOH

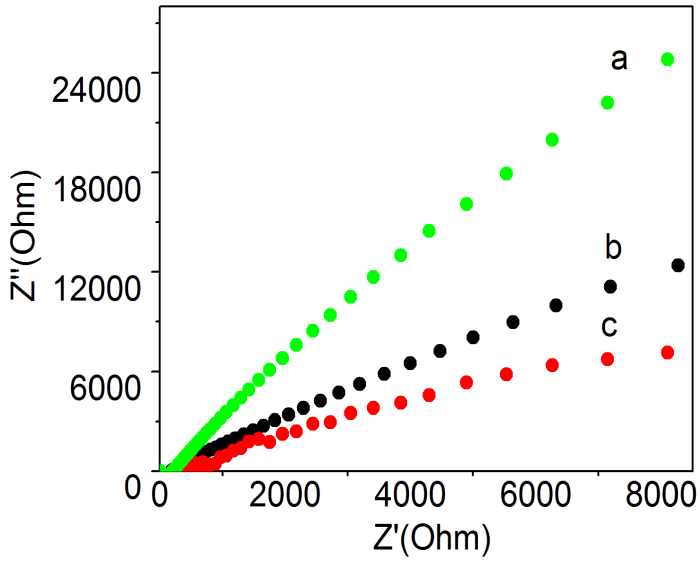

Fig. S3. Nyquist plots of EIS in 0.1 M KOH at (a) bare GCE, (b) PDMA/SPEEK/GCE and (c) SPEEK/PDMA/ CuNFs/GCE electrodes.

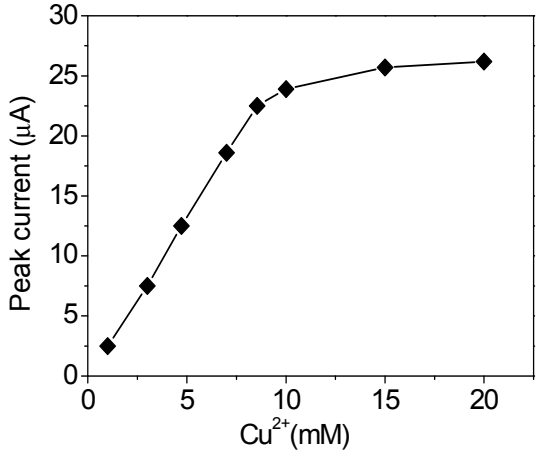

Fig. S4. Variation of copper concentration with peak current of glucose oxidation (0.1 M KOH, 1.0 mM glucose) at SPEEK/PDMA/CuNFs/GCE

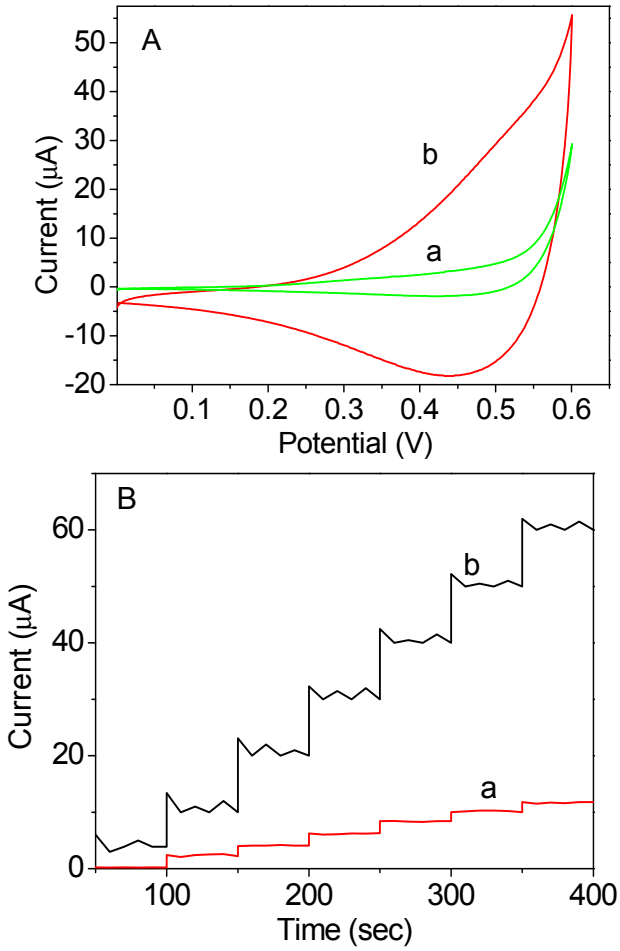

Fig. S5. (A) CVs and (B) Amperometric curves of different electrodes for 1 mM glucose oxidation in 0.1 M KOH, respectively; (a) PDMA/CuNFs/GCE, and (b) SPEEK/PDMA/CuNFs/GCE.