Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supplementary Information

Conducting polymers as multistep macromolecular sensors of working condition: Evidence from polyindole

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1. FTIR-ATR spectra

The two peaks observed in Indole monomer at 746 and 721cm^{-1} due to the out-of-plane deformation of the C_2-H and C_3-H bonds respectively, were not present in the polymer. The aromatic ring stretching peaks appeared around 1611, 1425, 1210, and 1110 cm^{-1}. The deformation of the benzene ring and the N-H vibration also indicates that the nitrogen and the benzene ring do not participate in the polymerization of Indole. It indicates that the polymerization has taken place at 2 and 3 positions.

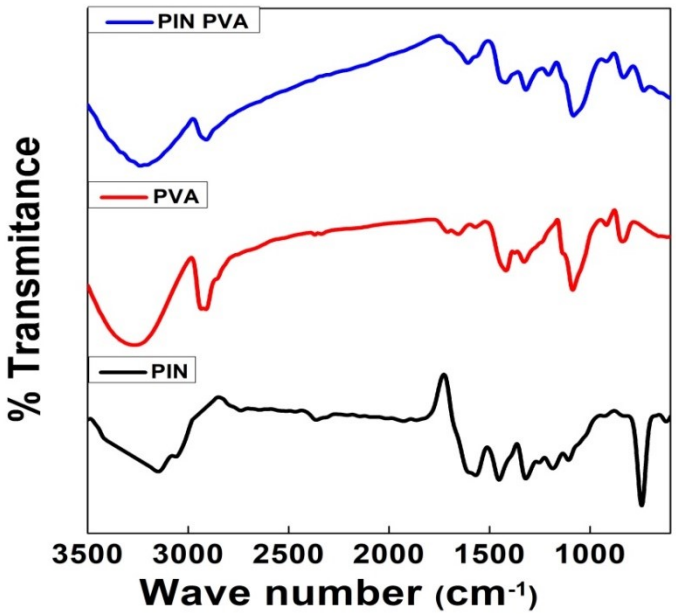

Fig. S1. FTIR spectrum of (a) PIN/PVA hybrid film. (b) Bare PVA film. (c)PIN powder

1. EDAX

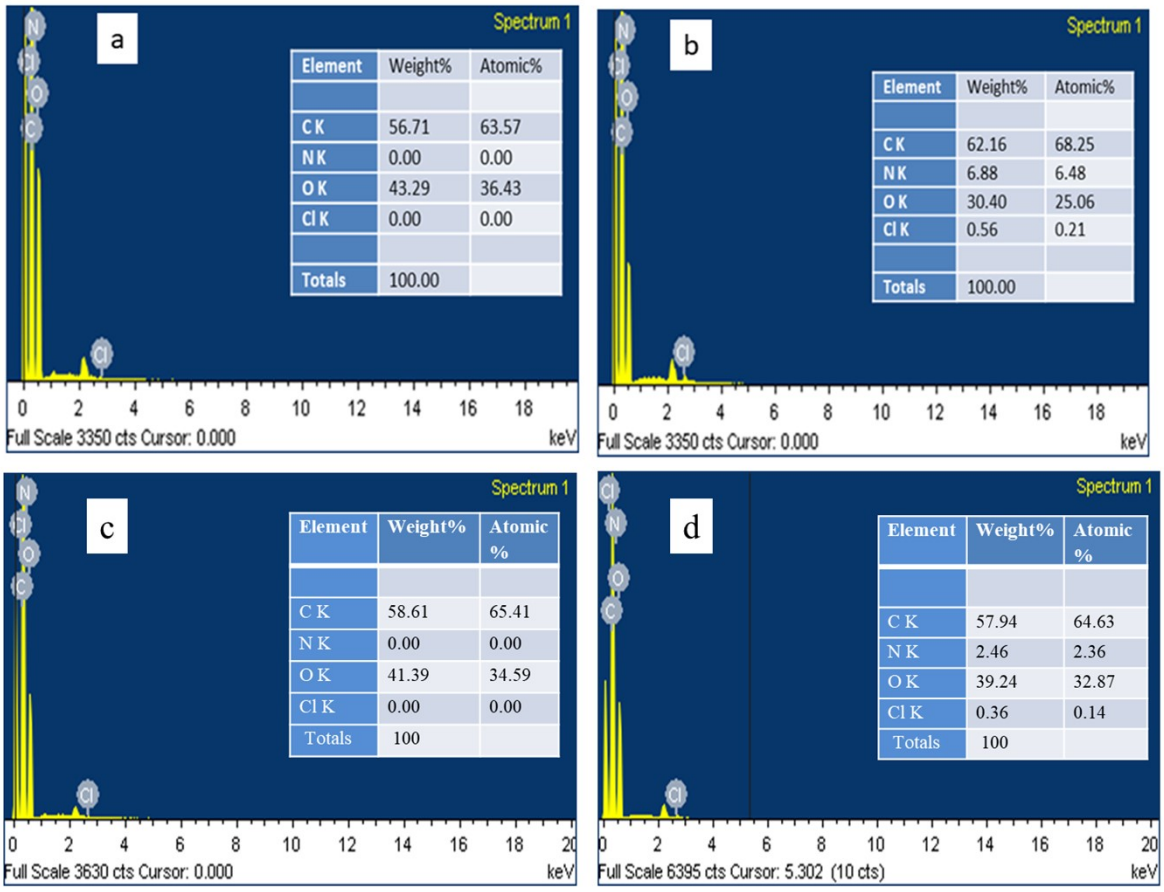

Fig. S2. EDAX data from (a) the surface of PVA film. (b) surface of PIN/PVA hybrid film. c) cross-section of the bare PVA film and d) cross-section of the PIN/PVA hybrid film

2. TGA

It can be observed from the figure that there is a the three-step weight loss of PIN/PVA hybrid film. Initial weight loss appeared around 101^{0}C is attributed to the removal of absorbed water molecule and surfactants. The second stage starting from 190^{o}C to 305 ^{0}C represents the elimination of the low molecular weight oligomers and the dopant molecules, which is in between and finally, the polymer backbone degradation was observed from 405 ^{o}C to 576 ^{o}C. The degradation of bare PVA film followed a two-step process. The first stage of weight loss

from 70 °C to 135 °C and the second stage from 240 °C to 520 °C respectively represents the elimination of absorbed water molecule and the polymer backbone degradation.

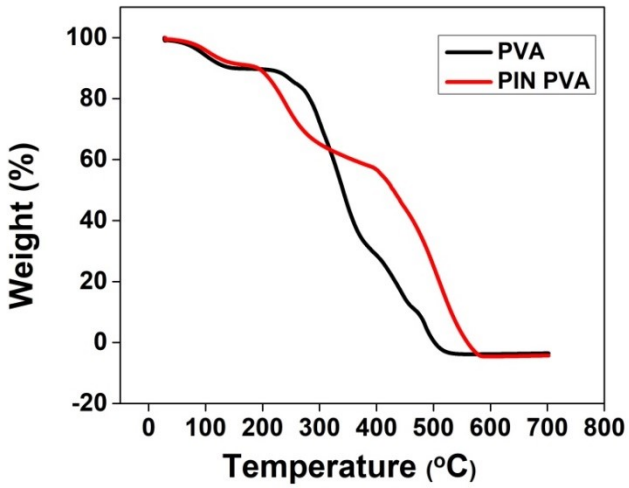

Fig. S3. TGA curve of bare PVA film and PIN/PVA hybrid film.

3. Conductivity

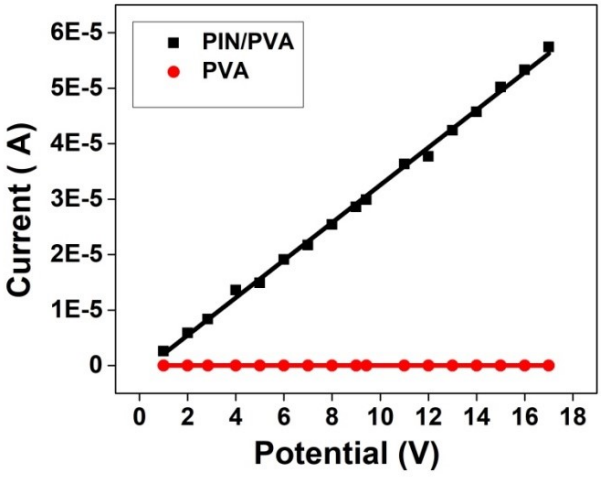

Fig. S4. I-V characteristic plot of bare PVA film and PIN/PVA hybrid film.

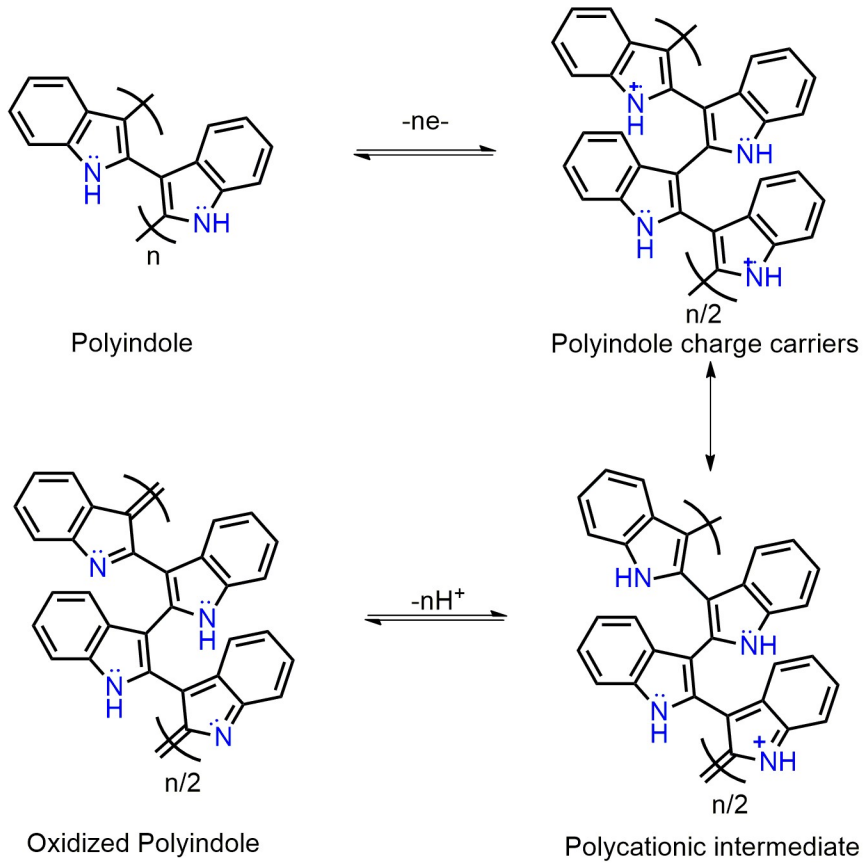

Fig. S5. Schematic representation of oxidation mechanism of polyindole**.**