Soy Polyester Urethane/TiO2 and Ce-TiO2 Nanocomposites: Preparation, Characterization and Evaluation of Electrochemical Corrosion Resistance Performance

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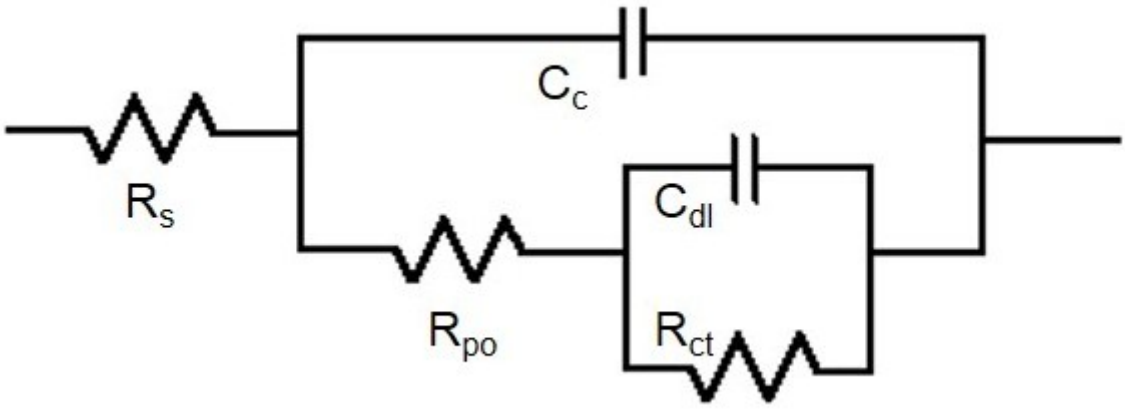
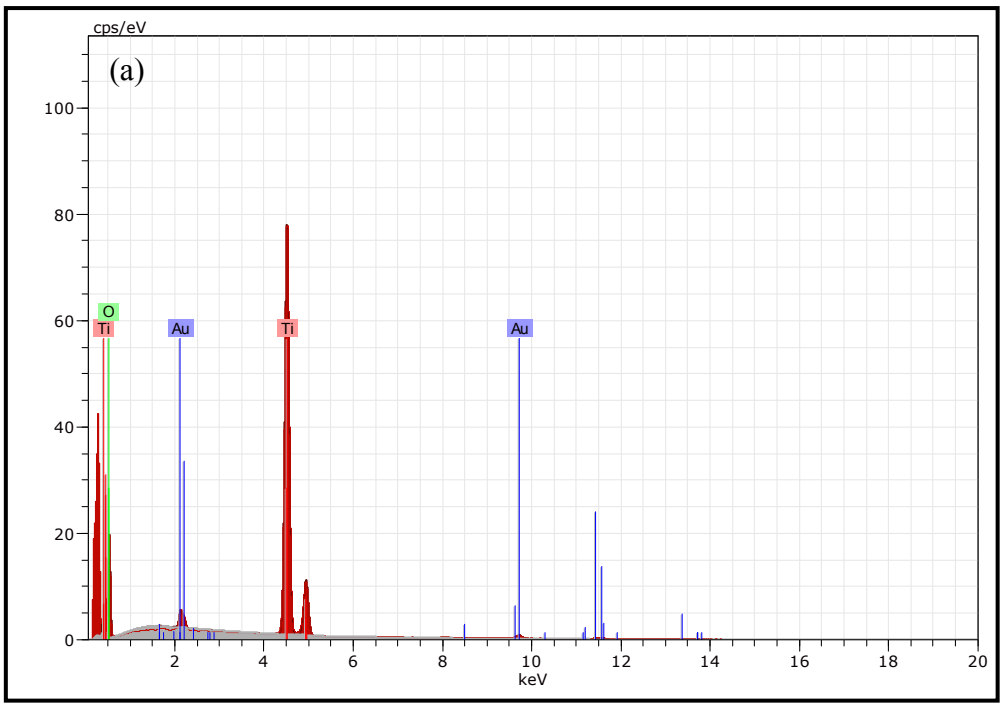
Fatty acid extraction:

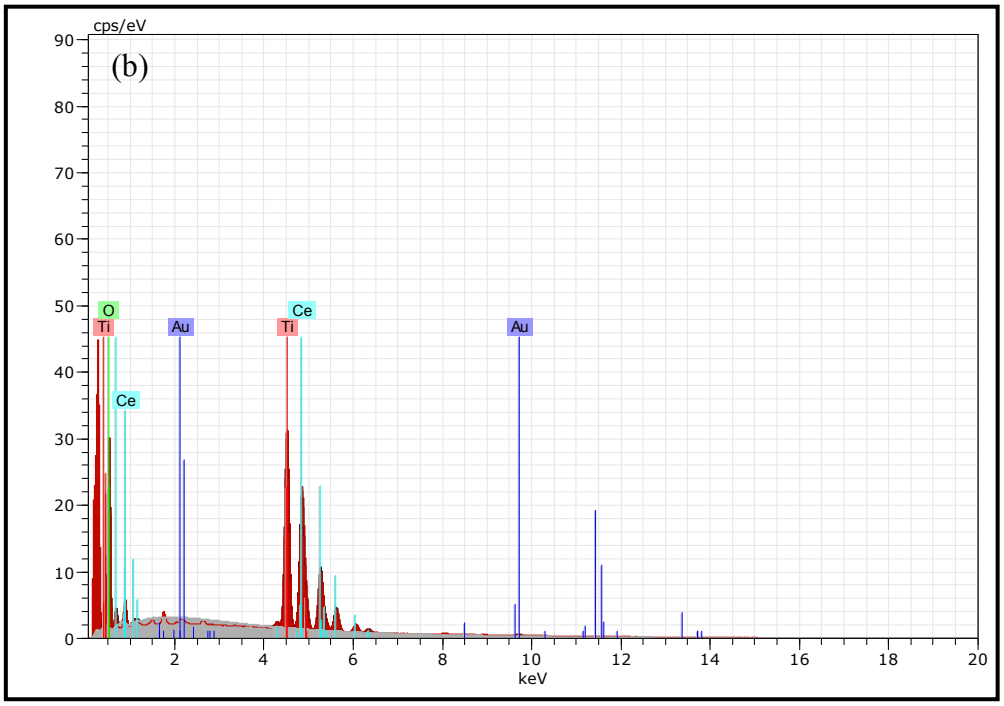
Fatty acid was extracted was extracted from soy oil as per the reported methods.[10] Soy oil-water mixture (1:1 by volume) was treated with aqueous sodium hydroxide (200 mL, 30 wt. %) and stirred for 4 h at 60 °C to generate the soap through saponification, then acidified with the required amount of sulfuric acid (30 wt. %) to reduce the pH< 2. The lower aqueous layer containing sodium sulfate and glycerin were separated, then the top layer of FA was washed with hot water at 60 °C. Finally, the liquid FA layer was dried on anhydrous sodium sulfate. The dried FA was used to synthesize the fatty acid polyol (FPOL).



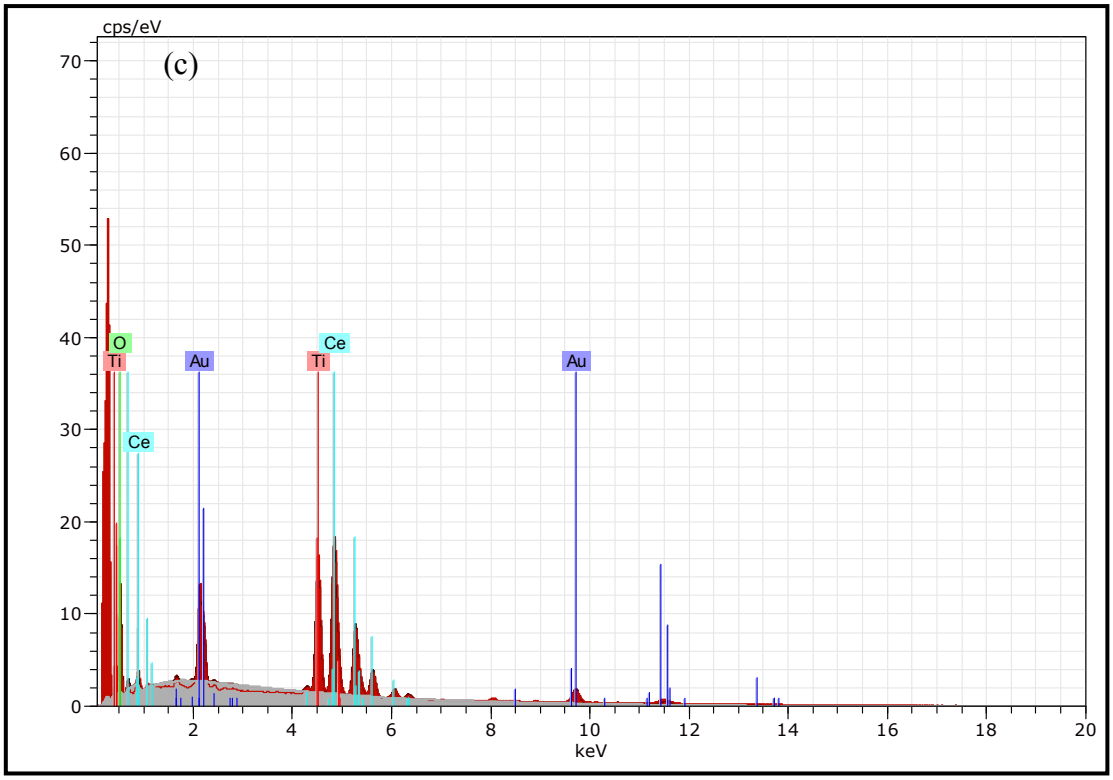
Supplementary figure 1. Equivalent electrical circuit



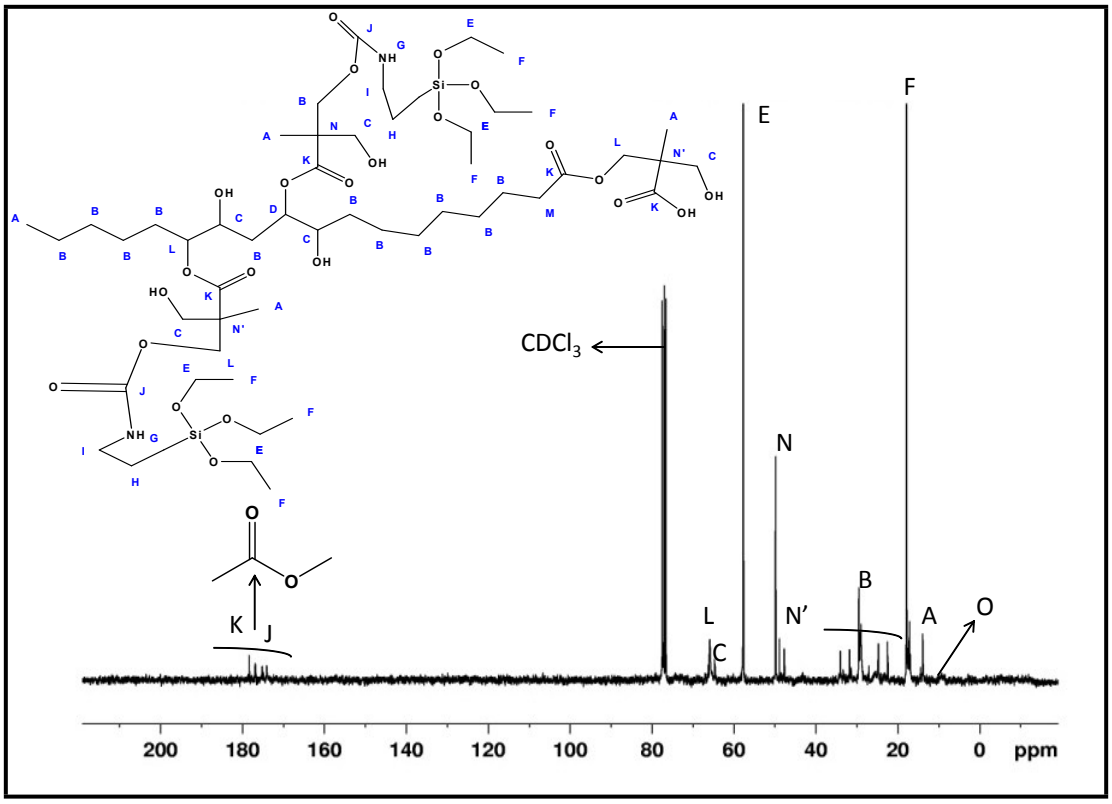
Supplementary figure 2 a. EDX spectra of TiO_2



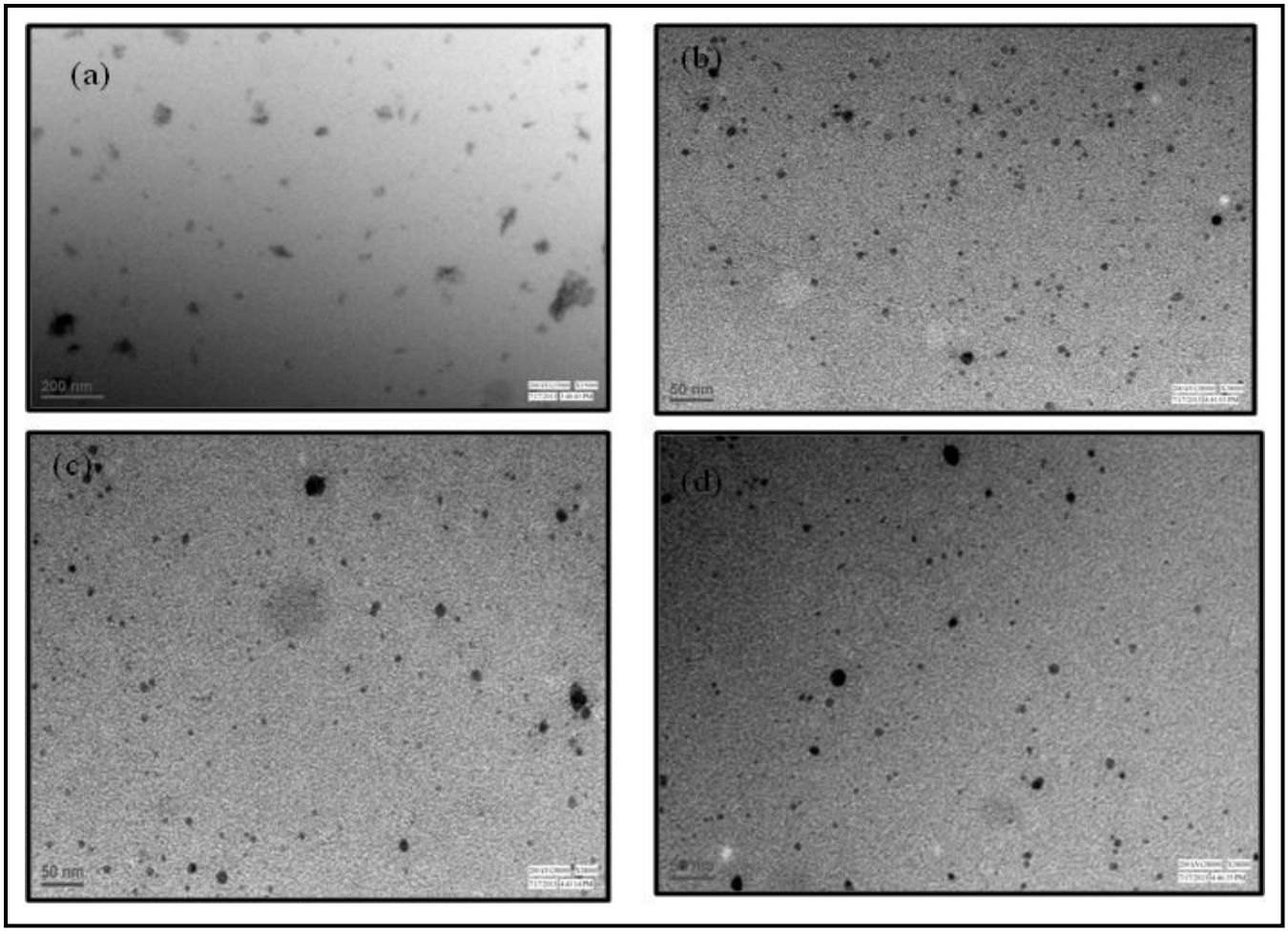
Supplementary figure 2 b. EDX spectra of Ce–TiO_2-I (c)



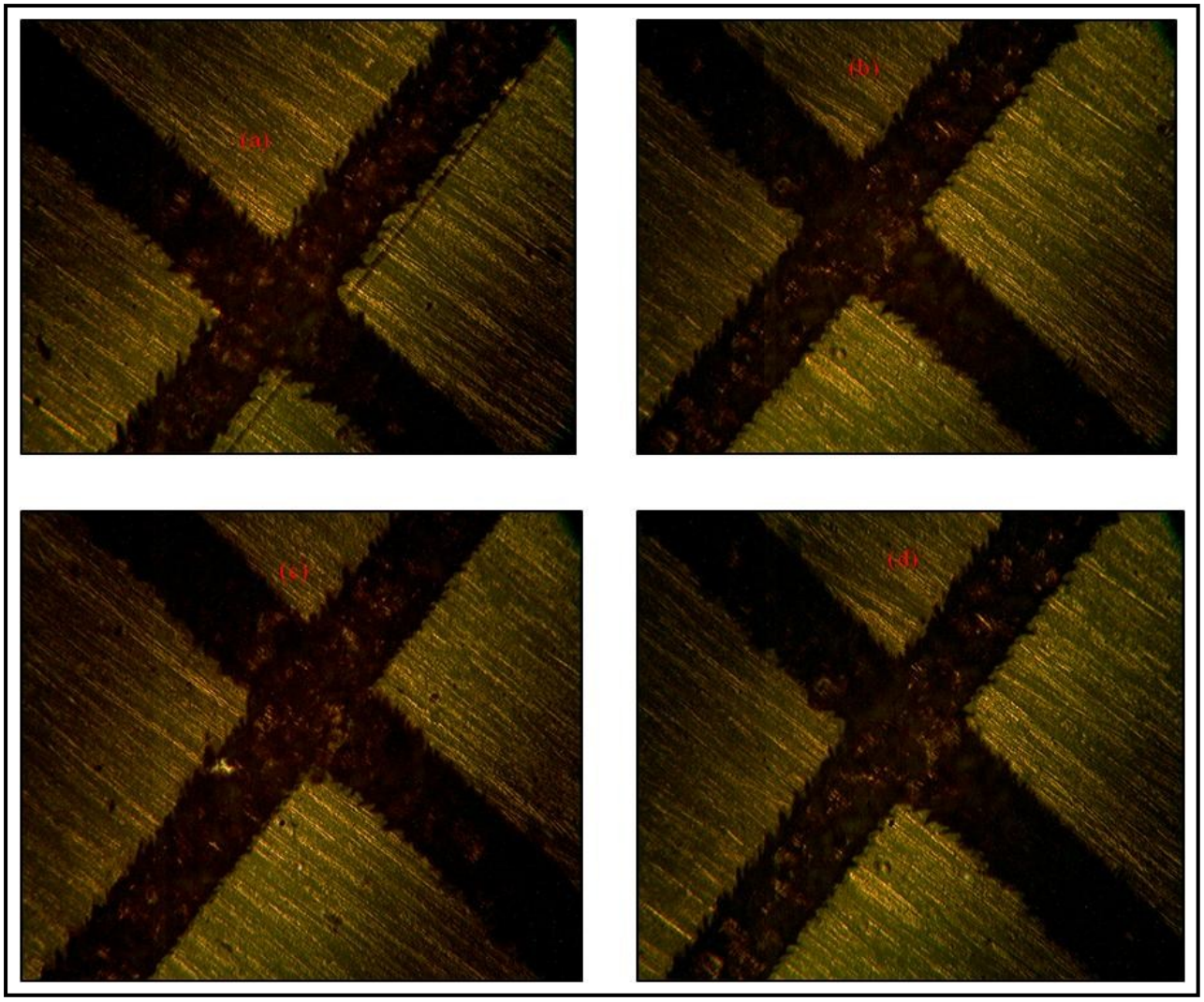
Supplementary figure 2 c. EDX spectra of Ce–TiO_2-II



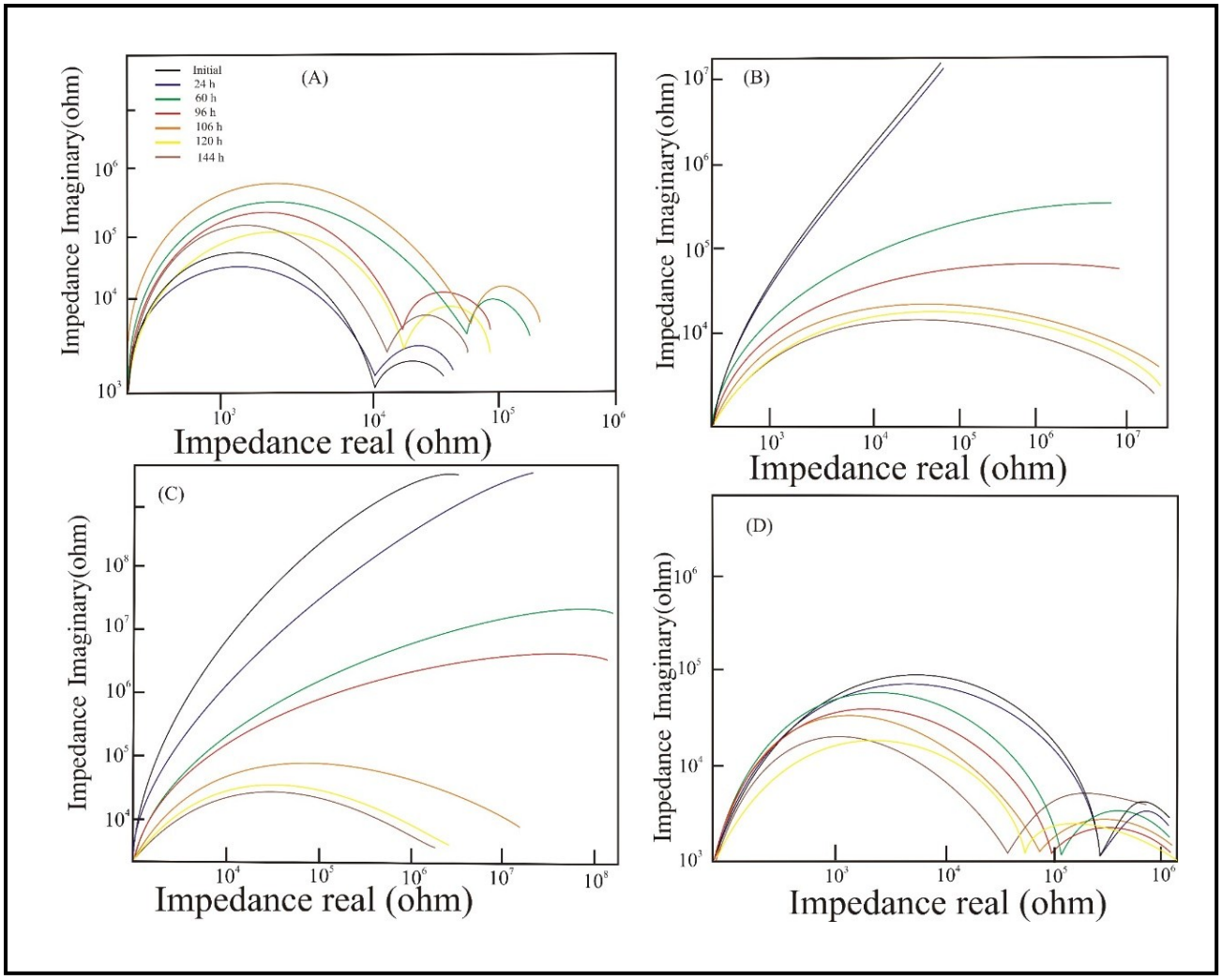
Supplementary figure 3. ^{13}C-NMR spectra of PEUTES



Supplementary figure 4. TEM micrographs of (a) PEUTES, (b) PEUTES-TiO_2, (c) PEUTES-TiO_2-I and (d) PEUTES -TiO_2-II nanocomposites



Supplementary figure 5. Optical micrographs for cross hatch test of (a) PEUTES (b) PEUTES-TiO_2, (c) PEUTES-Ce-TiO_2-I and (d) PEUTES-Ce-TiO_2-II nanocomposites.



Supplementary figure 6. Nyquist plot in 3.5 wt % NaCl solution of (a) PEUTES-TiO2 (b) PEUTES-TiO (c) PEUTES-Ce-TiO2-I and (d) PEUTES-Ce-TiO2-II

Supplementary Table 1. Physico-mechanical properties of PEUTES, PEUTES-TiO_2, PEUTES-Ce-TiO_2-I and PEUTES-Ce-TiO_2-II.

Sample → **Test ↓**	**PEUTES**	**PEUTES-TiO_2**	**PEUTES-Ce-TiO_2-I**	**PEUTES-Ce-TiO_2-II**
DTT (h)	1.0	0.75	0.75	0.75
DHT(h)	72	66	66	66
Scratch Hardness	6.5 Kg	11.2 Kg	11.9 Kg	12.5 Kg
Impact Test (26.8 kg/cm)	Pass	Pass	Pass	Pass
Gloss at 45 °C	38	35	33	30
Bending 1/8 inch	Pass	Pass	Pass	Pass
Cross hatch test	Pass	Pass	Pass	Pass
Thickness (µm)	105	110	112	115