

Electrochemical Properties of TiO_x/rGO Composite as an Electrode for Supercapacitor

Retno Maharsi,^{*a} Aditya Farhan Arif^b, Takashi Ogi^c, Hendri Widiyandari^{a,d}, and Ferry Iskandar^{a,e}

National Center for Sustainable Transportation Technology (NCSTT), Institut Teknologi Bandung, Jl. Ganesa No. 10, Bandung 40132, Indonesia

Department of New Investment, PT Rekayasa Industri, Jl. Kalibata Timur I No. 36, Jakarta 12740, Indonesia.

Department of Chemical Engineering, Graduate School of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi-Hiroshima, 739-8527, Japan.

Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Jl. Ir. Sutami 36A, Ketingan, Surakarta, 57126, Indonesia

Department of Physics, Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung, Jl. Ganesa No. 10, Bandung 40132, Indonesia

Supplementary information

1. X-ray diffraction data

1.1. X-ray diffraction pattern of TiO_x B before and after heating treatment

To prove the crystal stability of the employed TiO_x , the crystal structure of TiO_x B was observed after a heating treatment in an oven at 80 °C for 1 hour. There is no phase change and the pattern remain same.

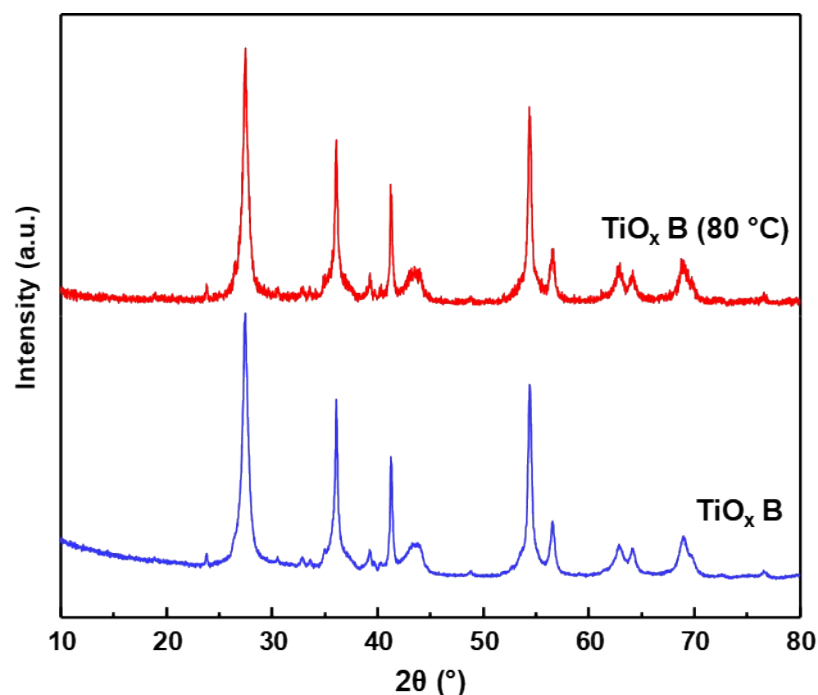


Figure S 1. Diffraction pattern of TiO_x B before and after heat treatment in oven at 80 °C

1.2. X-Ray diffraction patterns of rGO and TiO_x before and after impregnation

To enhance the specific capacitance of TiO_x/rGO , PEDOT:PSS conductive polymer was added to the composite. Addition of PEDOT:PSS does not change the crystal structure of TiO_x/rGO , probably due to its small amount.

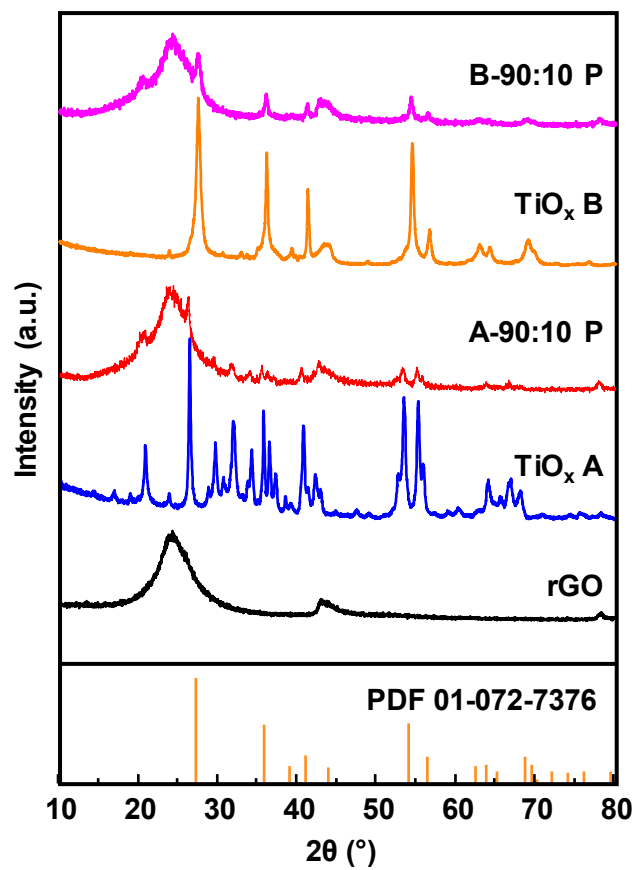


Figure S 2. Diffraction pattern of rGO and TiO_x before and after impregnation with composition of 90:10.

2. Effect of TiO_x and PEDOT:PSS addition on rGO structure

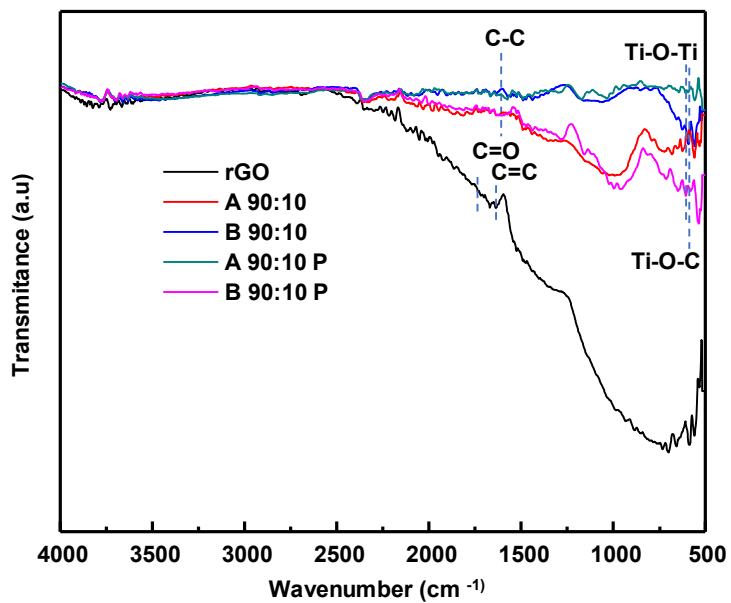


Figure S 3. FTIR spectra of rGO before and after TiO_x and PEDOT:PSS addition

3. Electrochemical properties of TiOx/rGO

3.1. The data fitting of Electrochemical Impedance Spectroscopy (EIS) curves

Table S 1. The resistances value of Sample A and B based on EIS data fitting

Sample	TiOx A	A-70:30	A-90:10	A-95:5	TiOx B	B-70:30	B-90:10	B-95:5
Rs (Ω)	3.18	2.73	1.678	2.69	2.37	4.13	2.56	4.732
Rct (Ω)	11.27	4.18	5.63	41.95	68.27	3.72	13.59	53.75
Goodness of fit	110e-6	672e-6	3.65e-3	787e-6	589e-6	446e-6	6.20e-4	140e-6

3.2. EIS curves of sample A and B after PEDOT:PSS addition

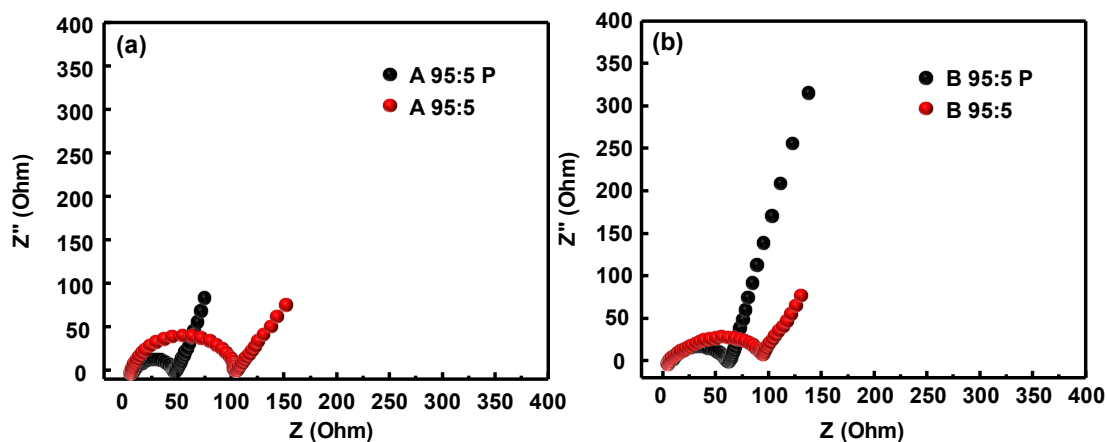


Figure S 4. Nyquist plots of sample (a) A 95:5 and (b) B 95:5 before and after PEDOT:PSS addition

4. Sample performance stability

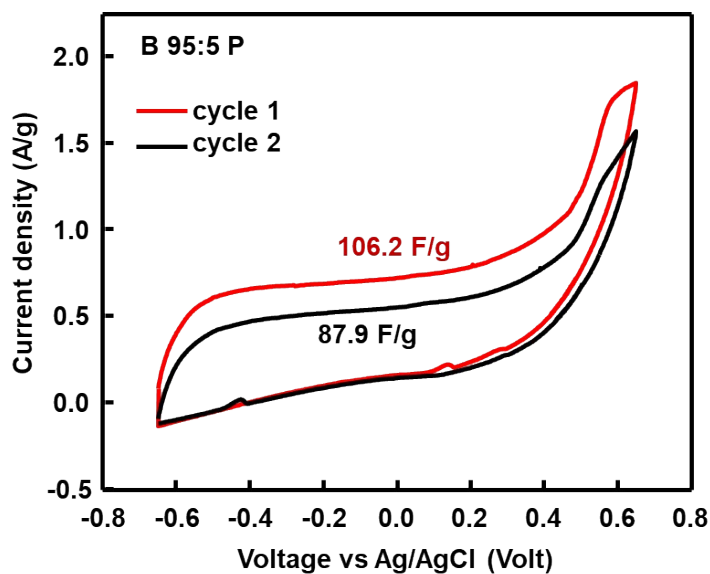


Figure S 5. CV curves of sample B-95:5 P for first and second cycle.

5. Crystal structure of Sample B after PEDOT:PSS addition

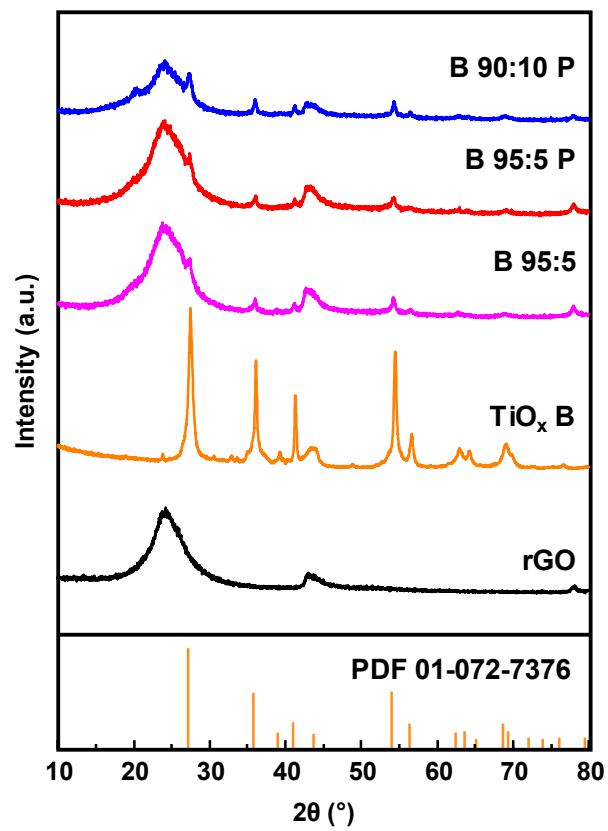


Figure S 6. Diffraction pattern of rGO and TiO_x B before and after impregnation with rGO/TiO_x composition of 95:5 (with and without PEDOT:PSS addition) and 90:10 with PEDOT:PSS addition