Supplementary data

Simple preparation method for Styrofoam-TiO_2 composites and their photocatalytic application for dye oxidation and Cr(VI) reduction in industrial wastewater

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Fig. S1. Procedure for the production of W-TiEPS from the wasted expanded polystyrene in a fishing net float.

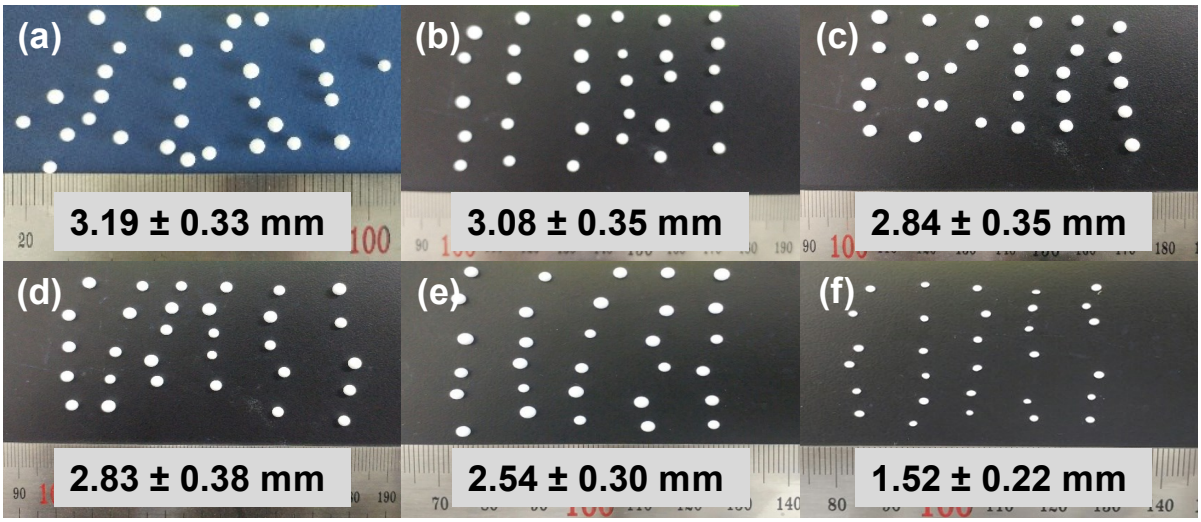

Fig. S2. Size comparison of EPS-TiO_2 composites (n = 30) prepared in solutions containing different volume percentages of acetone (v/v): (a) pristine EPS balls, (b) 10%, (c) 30%, (d) 50%, (e) 70%, and (f) 90%.

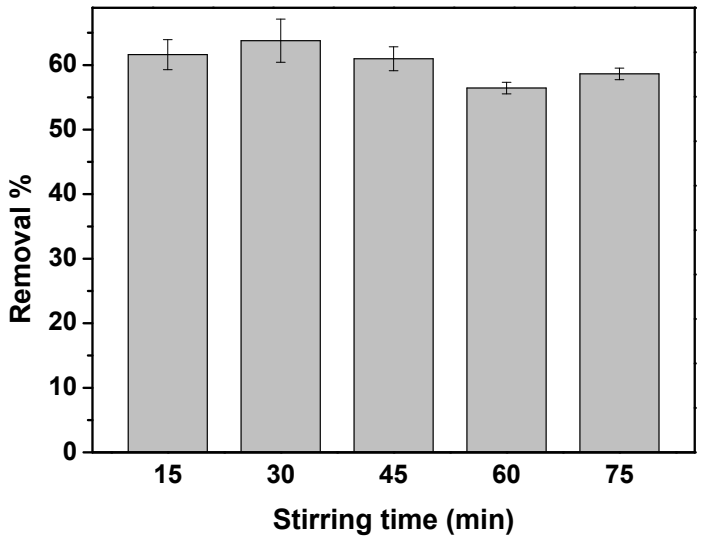

Fig. S3. Effect of stirring time using diluted solvent on the photocatalytic activity of EPS-TiO_2 composites. Photocatalytic experimental conditions: initial dye concentration = 5 μM; catalyst dose: 1.6 g/L; irradiation time = 60 min; light intensity = 3.93×10^{-9} einstein/cm^2/s. Data are plotted as mean of replicates and error bars represent range of observed values.

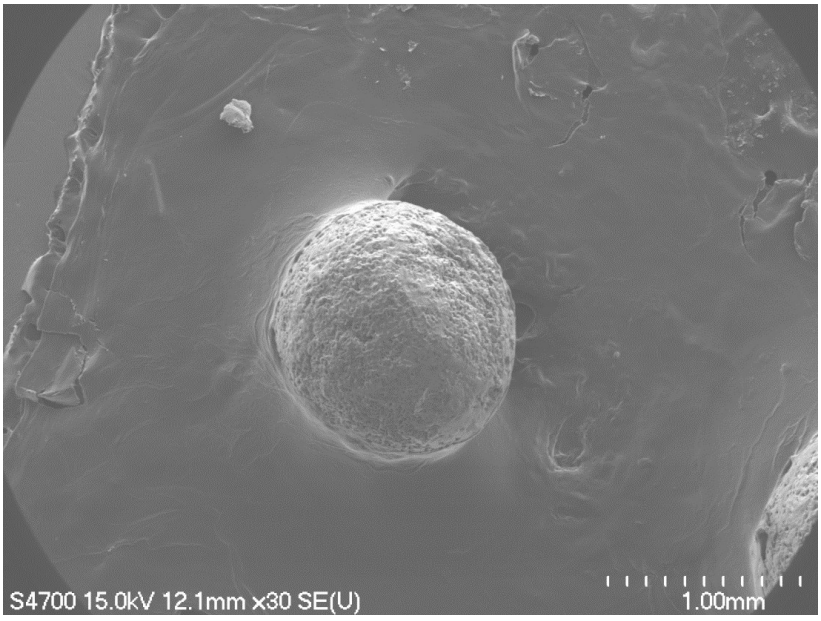

Fig. S4. FE-SEM image (× 30) of EPS-TiO_2 composite prepared using a diluted solvent containing 90% (v/v) acetone and 4% (w/v) TiO_2.

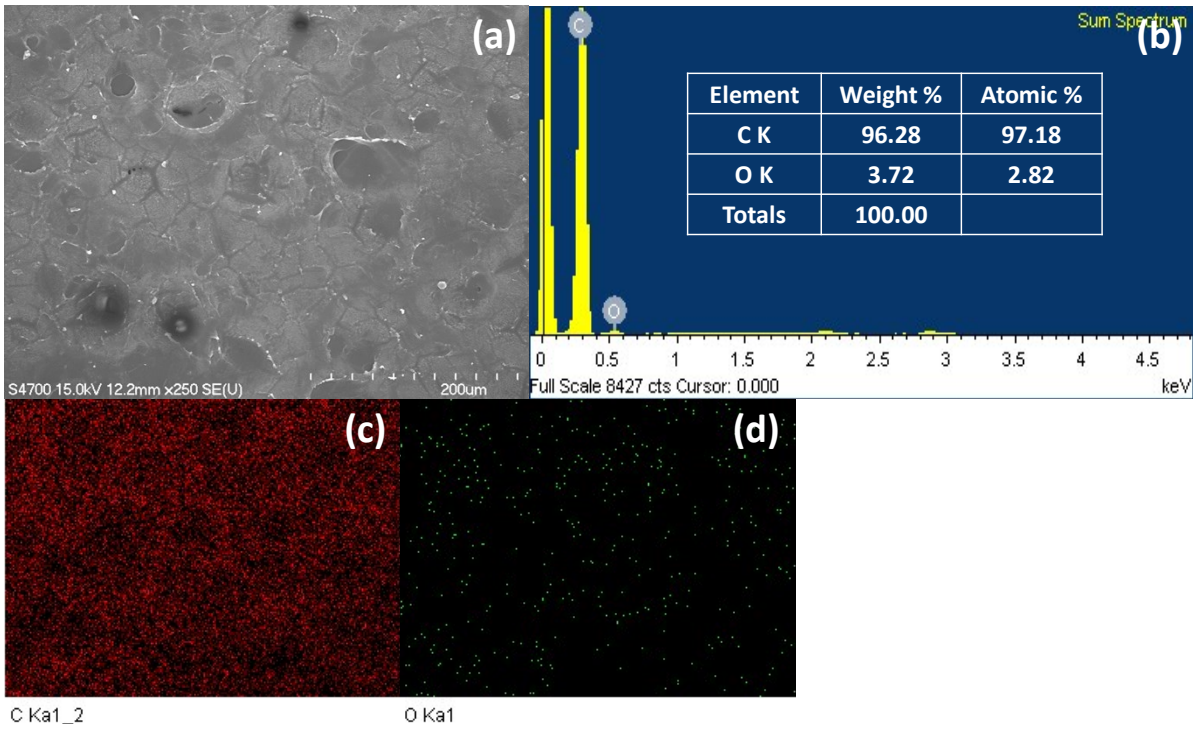

Fig. S5. (a) Surface SEM image (× 250), (b) elemental analysis by EDS, and EDS mappings of (c) C and (d) O of a pristine EPS ball.

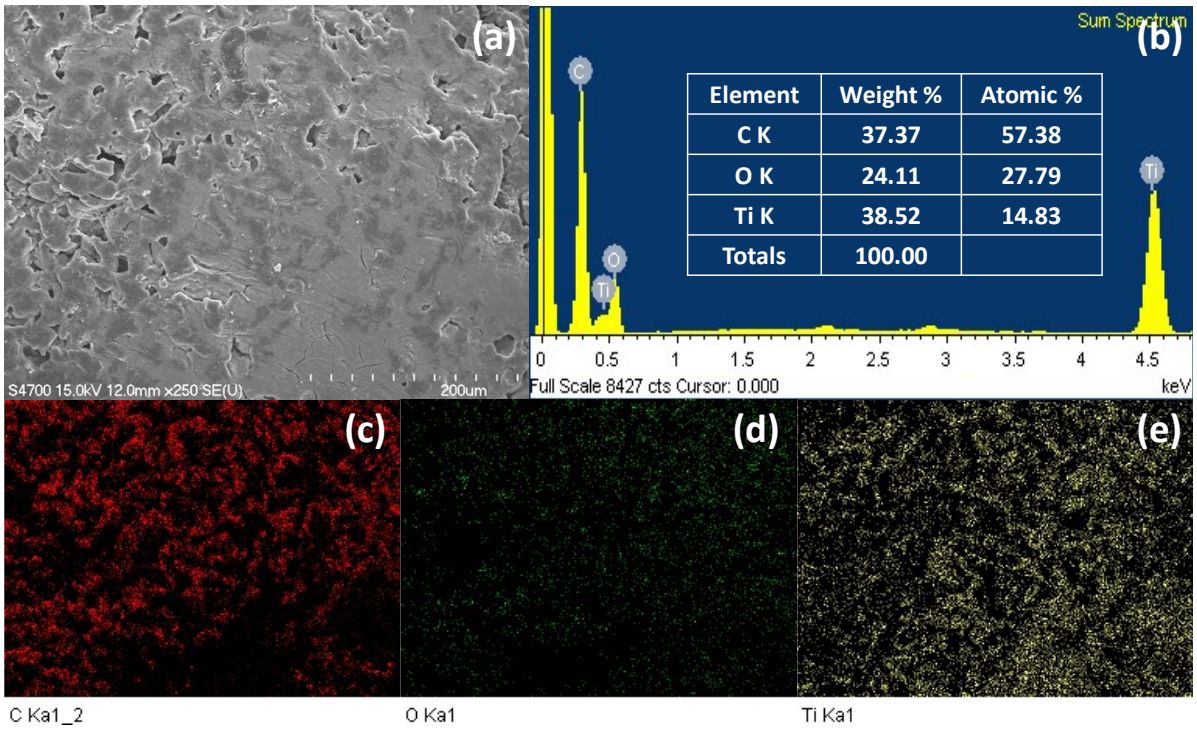

Fig. S6. EPS-TiO_2 composite prepared using a diluted solvent containing 90% (v/v) acetone and 4% (w/v) TiO_2: (a) surface SEM image (× 250), (b) elemental analysis by EDS, and EDS mappings of (c) C, (d) O, and (e) Ti.

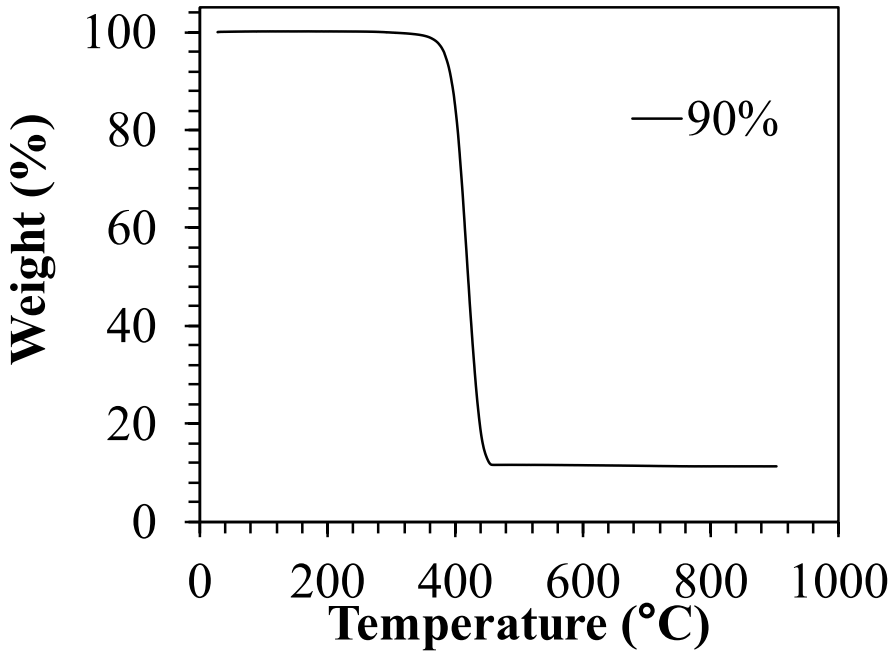

Fig. S7. TGA analysis of the EPS-TiO_2 composite prepared using a diluted solvent containing 90% (v/v) acetone and 4% (w/v) TiO_2.

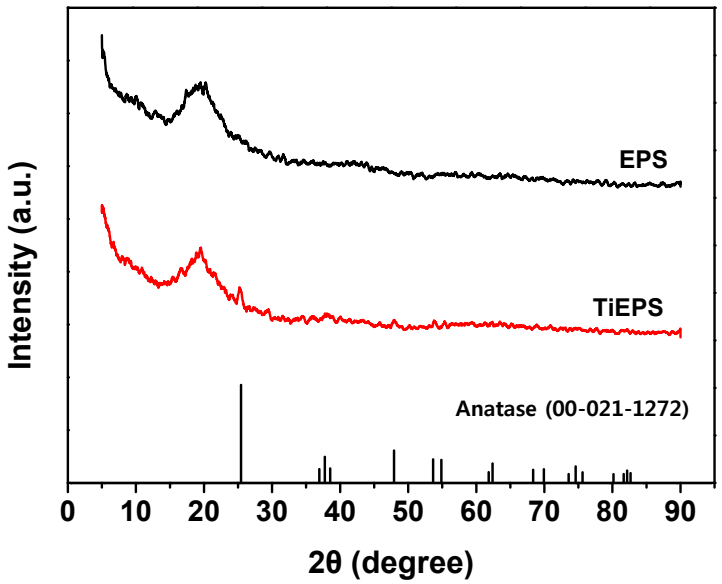

Fig. S8. XRD patterns of the pristine EPS and EPS-TiO_2 composite.

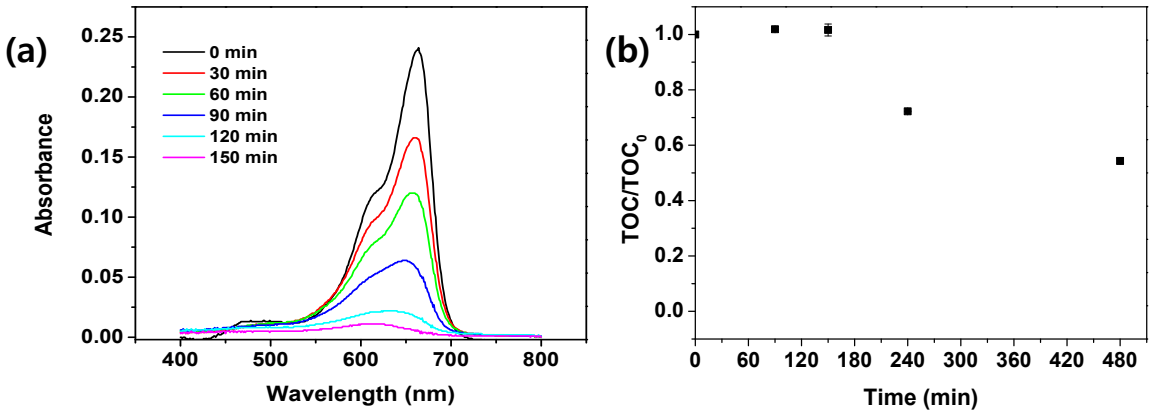

Fig. S9. Change in (a) UV-Vis spectrum of methylene blue and (b) TOC during photocatalytic removal of methylene blue dye. Photocatalytic experimental conditions: initial dye concentration = 5 μM; catalyst dose: 1.6 g/L; light intensity = 3.93×10^{-9} einstein/cm^2/s. Data are plotted as mean of replicates and error bars represent range of observed values.

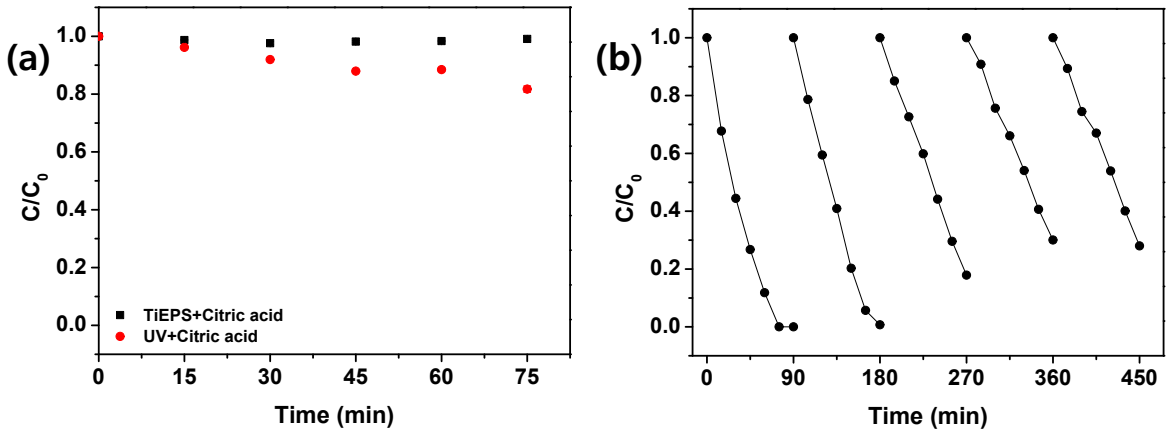

Fig. S10. (a) Cr(VI) removal by W-TiEPS under dark and UV irradiation in the presence of citric acid; (b) Photocatalytic reduction of Cr(VI) by W-TiEPS under UV irradiation during 5 reuse cycles (initial Cr(VI) concentration = 8.442 mg/L; catalyst dose: 2.0 g/L; citric acid concentration = 0.4 mM; light intensity = 3.93×10^{-9} einstein/cm^2/s). Data are plotted as mean of replicates and error bars represent range of observed values.

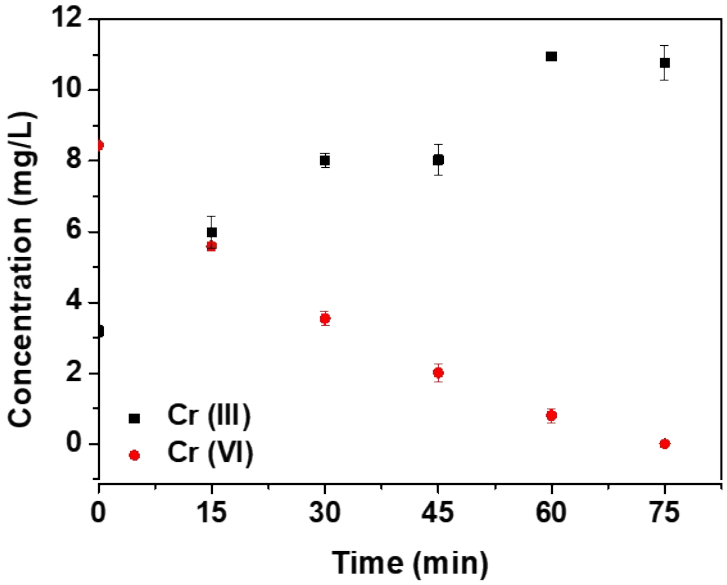

Fig. S11. Cr(VI) and Cr(III) concentration by W-TiEPS under UV irradiation

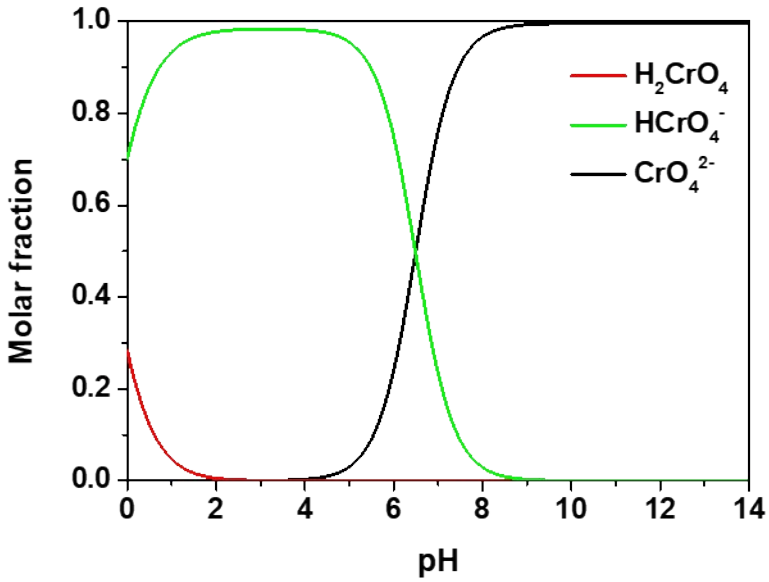

Fig. S12. Chromium speciation as a function of solution pH under experimental conditions simulated with visual MINTEQ 3.0

Table S1

Chemical composition of industrial Cr(VI) plating wastewater.

Total Cr	Cr(VI)	Cu^{2+}	Ni^{2+}	Fe^{2+}	Ca^{2+}
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1187.37	844.20	11.22	32.74	4.54	31.55
Cl^-	NO_3^-	SO_4^{2-}	PO_4^{3-}	pH	DOC
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(-)	(mg/L)
567.95	639.79	2920.08	585.42	1.93	47.85