Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

Titanium Oxide Nanoparticle Dispersions in a Liquid Monomer and Solid Polymer Resin Prepared by Sputtering

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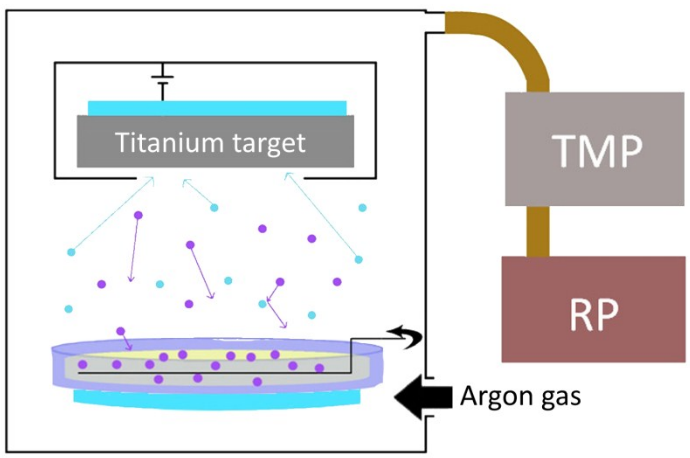

Figure S1. Schematic illustration of the magnetron sputtering device for the preparation of nanoparticle dispersion in liquid: the liquid PEEL is contained inside a glass petri dish placed below the titanium sputtering target. As argon gas ions impinge on the target surface, NPs detach from it, and fall into PEEL. A Mechanical stirrer was installed inside the sputtering chamber. Ar gas purging and vacuum systems allow for controlling the atmosphere and vacuum level of the sputtering chamber. The sputtering target can be cooled and the temperature of the substrate can be controlled.

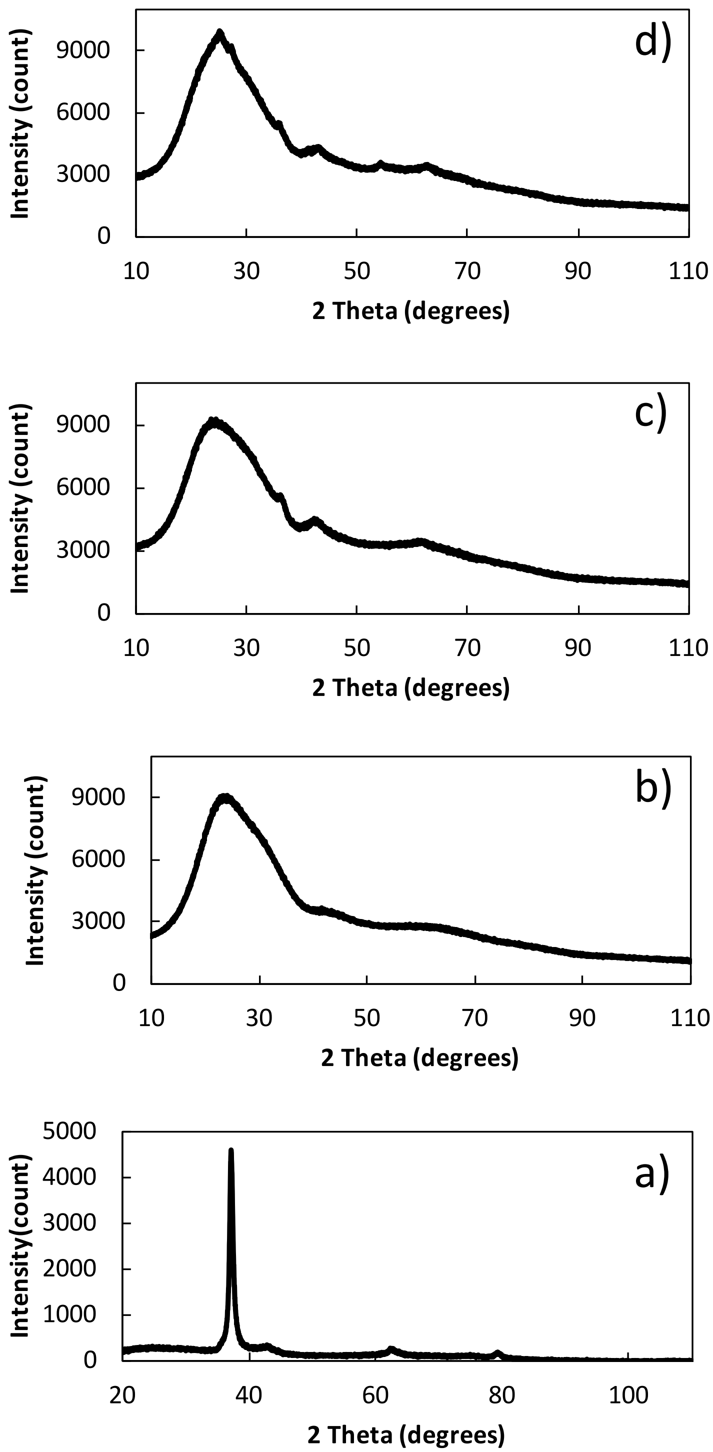

Figure S2. XRD patterns of samples obtained via (a) green-plasma sputtering; (b) glass substrate without sputtering Ti on it; (c) blue-plasma sputtering; (d) corresponds to sample (c) after annealing at 500 °C for 2 h under N_2.

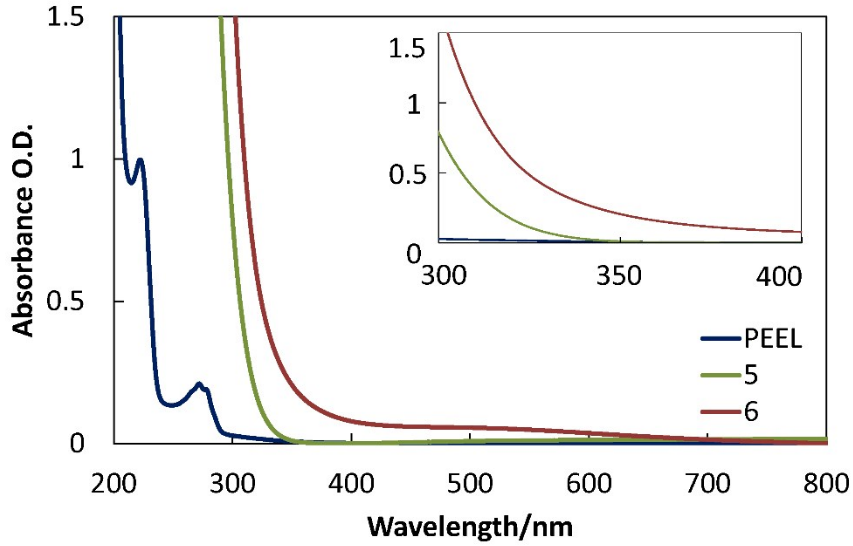

Figure S3. UV-Vis spectra of PEEL, and the 30 minutes blue-plasma sputtered samples that underwent to also 30 and 60 minutes of green-plasma sputtering for sample 5 and 6 (also see Table 1 in the main text), respectively.

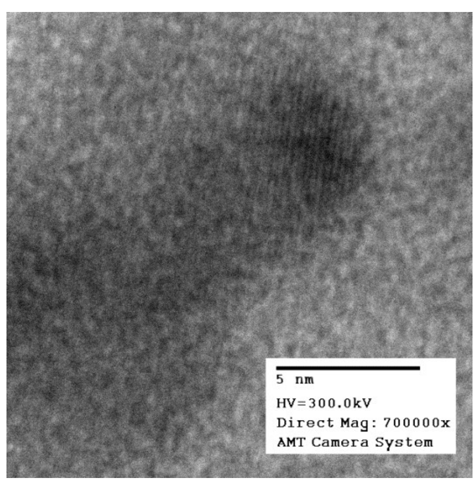

Figure S4. TEM image taken from a sample sputtered in blue-plasma condition for 30 minutes at 400 mA.

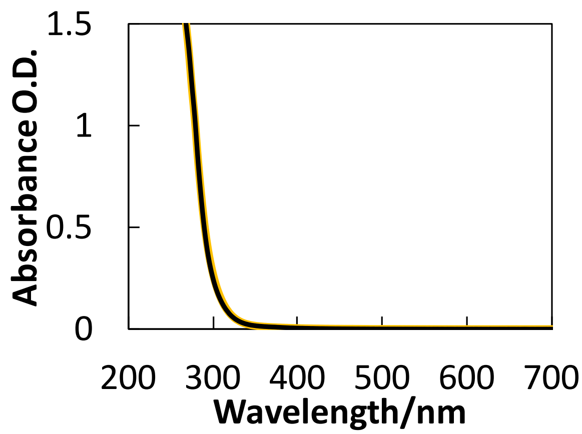

Figure S5. UV-Visible absorption spectra for an as-synthesized blue-plasma sputtered sample (black curve), and the same sample after 3 days (orange curve).

Equation SE1.

$$Q_{sca} = \frac{8}{3}\left|\frac{n^2 - 1}{n^2 + 2}\right|^2\left(\frac{4\pi a}{\lambda}\right)^4$$

Equation SE1. Represents the scattering probability (Q_{sca}) of a photon with wavelength λ passing through a nanoparticle of radius a. As the radius becomes smaller than the light wavelength, the scattering probability drops with a power of four dependence.[1]

Equation SE2.

$$n = \sqrt{\sum_i n_i^2 V_i}$$

Equation SE2. Gives an approximation of the refractive index (n) of composite compounds, starting from the refractive indices (n_i) of each component (i) and its corresponding volume fraction (V_i). [2]

Equation SE3.

$$\nu = \frac{n_D - 1}{n_F - n_C}$$

Equation SE3. Defines the Abbe number. The value of ν is used to evaluate the dispersion of light in materials: high values correspond to small chromatic aberrations. n_D,n_F and n_C are respectively the measured refractive indices of the material at the wavelength of the Fraunhofer D, F and C spectral lines (589.3 nm, 486.1 nm and 656.3 nm, respectively). [3]

References:

[1] B. S. Luk'yanchuk, M. I. Tribel'skii and V. V. Ternovskii, V. V. Light scattering at nanoparticles close to plasmon resonance frequencies. *J. Opt. Technol.*, **2005**, *73*, 371-377.

[2] Y.-Q. Li, S.-Y. Fu, Y. Yang and Y.-W. Mai, Facile synthesis of highly transparent polymer nanocomposites by introduction of core-shell structured nanoparticles. *Chem. Mater.*, **2008**, *20*, 2637-2643.

[3] T. Matsuda, Y. Funae, M. Yoshida, T. Yamamoto and T. Takaya, Optical material of high refractive index resin composed of sulfur-containing aromatic methacrylates. *J. Appl. Polym. Sci.*, **2000**, *76*, 50-54.