Supplementary material for

Interstitial Boron-Doped Anatase TiO_2 thin-film on Optical Fibre: Atmospheric Pressure-Plasma Enhanced Chemical Vapor Deposition as the Key for Functional Oxides Coatings on Temperature-Sensitive Substrates

Miguel Quesada-González, Kamal Baba, Carlos Sotelo-Vázquez, Patrick Choquet, Claire J. Carmalt, Ivan P.Parkin and Nicolas D. Boscher**

* Corresponding author. E-mail: i.p.parkin@ucl.ac.uk; nicolas.boscher@list.lu

Thin film characterization

Scanning electron microscopy (SEM), employed to characterize the thickness and morphology of the coatings, was performed on a Hitachi SU-70 FE-SEM. Prior to SEM observations, the nonconductive sample was sputter-coated with 5 nm of platinum to prevent image charging and distortion. XPS analyses were performed on a Kratos AxisUltra DLD instrument using a monochromatic Al Kα X-ray source (hυ = 1486.6 eV) at pass energy of 20 eV. AES was performed on a ThermoVG Microlab 350 operating at 20 kV, 3 nA and 30°. Argon sputtering operating at 2 keV and 2 mA was used for approximately 500 s in a rostering mode in order to remove surface contamination and gain information on the elemental composition in the bulk of the coating. The peak positions of the samples were referenced with respect to carbon (C 1s) at 285.4 eV. The Raman spectra were recorded with a Renishaw inVia micro-Raman spectrometer at an excitation wavelength of 532 nm with a laser power of approximately 0.44 mW focused on a 1 μm^2 spot.

Photocatalytic test

The photocatalytic activity of undoped and B-doped TiO_2 films under UV light was evaluated by measuring the photodecomposition of methylene blue (MB) in aqueous solution ($C_{16}H_{18}N_3S$–Cl–$3H_2O$; 0.05 wt.% in H_2O, Sigma-Aldrich) with an initial concentration of 10 $\mu mol.L^{-1}$ and a volume of 2 mL. The samples with a size of 1 cm^2 were immersed in the dye solution in a 12 well plate (each sample in a different well). The well plate containing the

samples and the dye was stirred using an orbital shaker (250 rpm) under irradiation of a 16 W black light lamps (Herolab; 365 nm, 2 $mW.cm^{-2}$). Before light irradiation, the solutions were stirred in dark for 2 h to ensure the establishment of an adsorption–desorption equilibrium. Photocatalytic degradation was monitored by measuring the absorption spectra of the MB solution at 664 nm with a UV-Vis spectrophotometer (Tecan Infinite M1000 Pro).

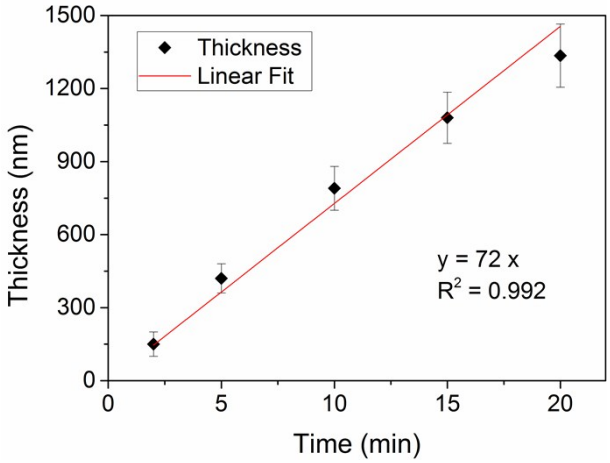


Fig. S1. B-TiO_2 film thickness *vs* time of deposition. The linear fitting represents the growth rate of the films.

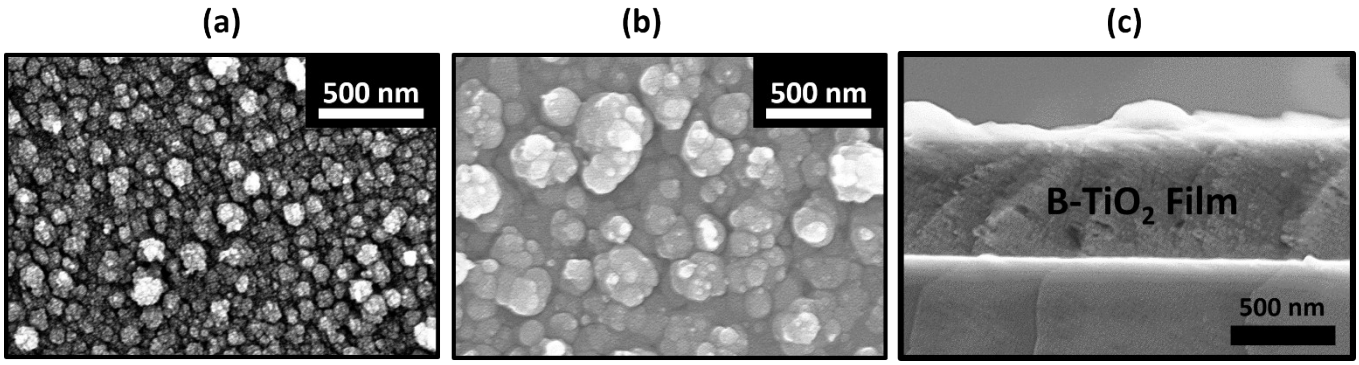


Fig. S2. SEM top-view images of (a) undoped and (b) boron-doped TiO_2 thin films on Si wafers; (c) SEM cross-section image of B-TiO_2 thin film, deposited in 10 minutes, by AP-PECVD.

Sample	(a) Composition at. %				
	Ti	O	C	N	B
Undoped TiO_2	28.87	61.59	8.16	1.39	0.00
B-TiO_2	27.91	61.61	3.53	0.96	4.29

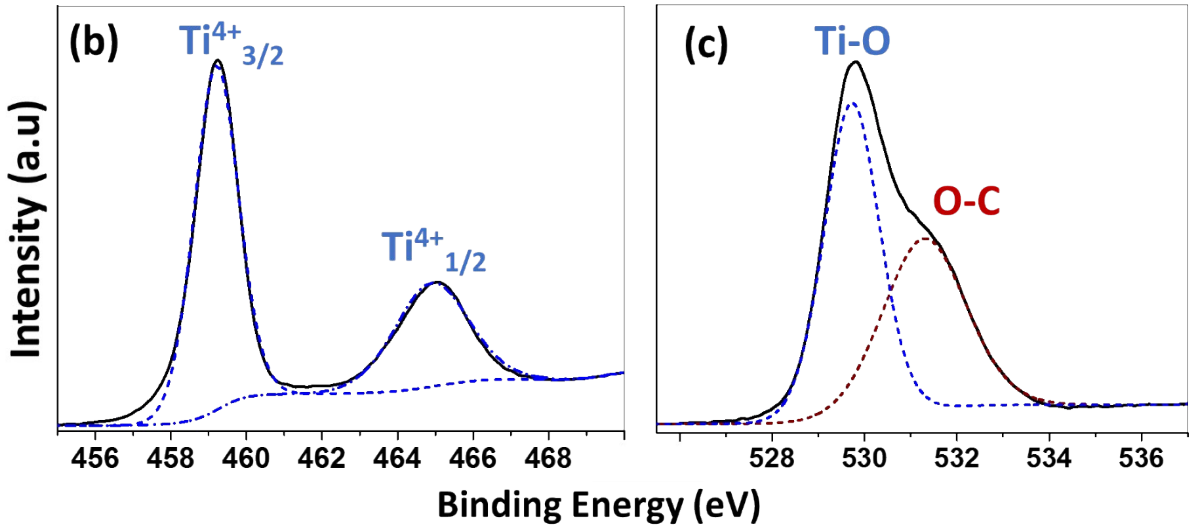


Fig. S3. (a) Table containing the composition of the thin films in at. % obtained by XPS; XPS spectra of B-TiO_2 thin-film deposited by AP-PEVCD; (b) Ti 2p and (c) O 1s spectra.

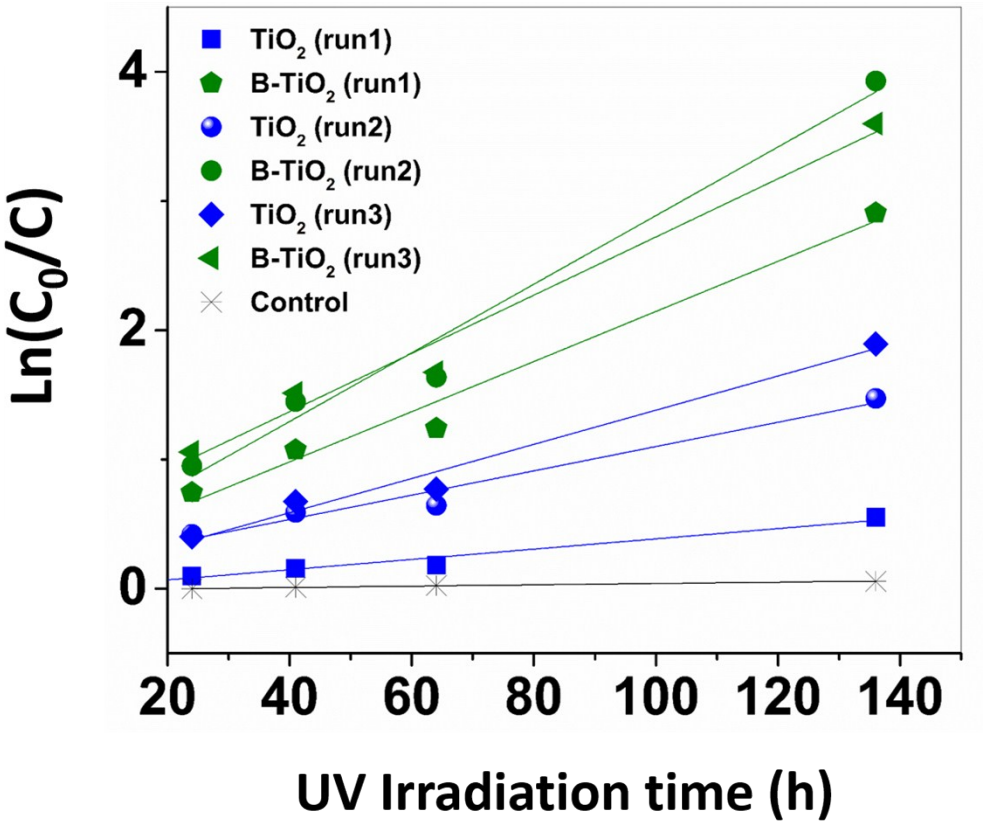
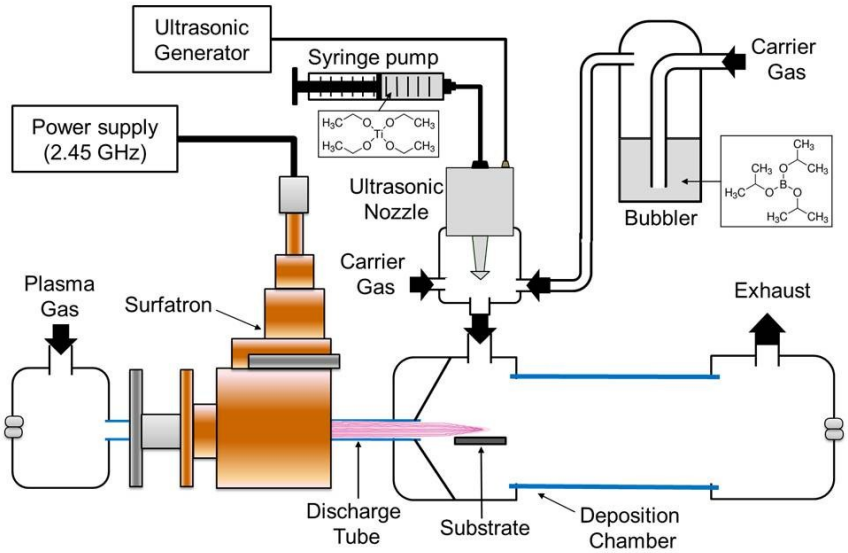


Fig. S4. Photocatalysis test with methylene blue: $Ln(C_0/C)$ calculated from absorbance *vs* the time of irradiation with UV light (365 nm). The different cycles of photocatalytic test are



expressed as run 1, 2 and 3.

Fig. S5. Schematic of the AP-PECVD experimental setup for the deposition on silicon wafers and glass (planar) substrates.