Electronic Supplementary Material (ESI) for Nanoscale

Bimodal mesoporous titanium dioxide anatase films templated by a block polymer and an ionic liquid: influence of the porosity on the permeability.

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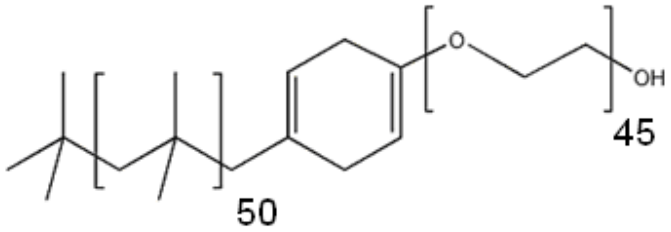


Fig. S1 Schematic representation of the PIB-PEO polymer.

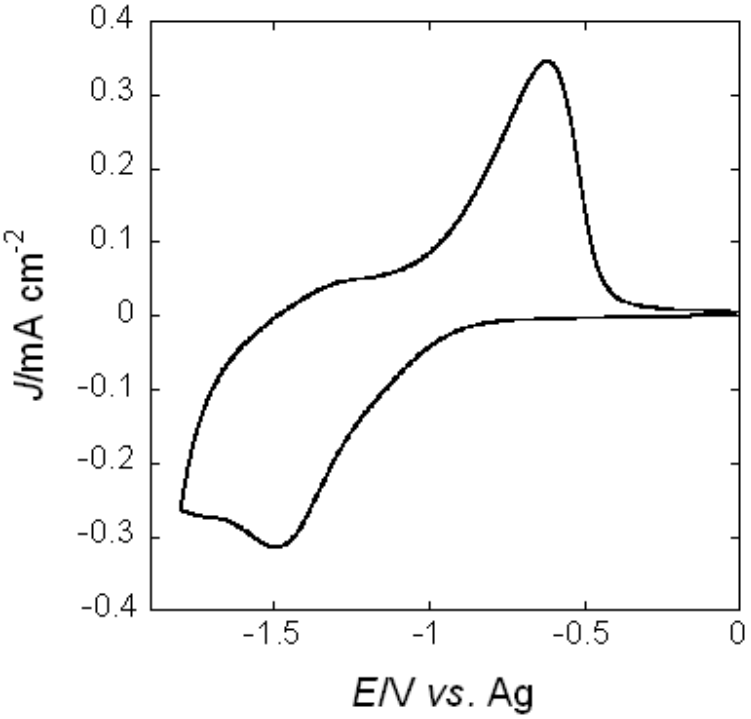


Fig. S2 Cyclic voltammetry of monomodal anatase film (PIB-PEO only) with $LiClO_4$ 1M in propylene carbonate, scan rate = 10 mV s^{-1}.

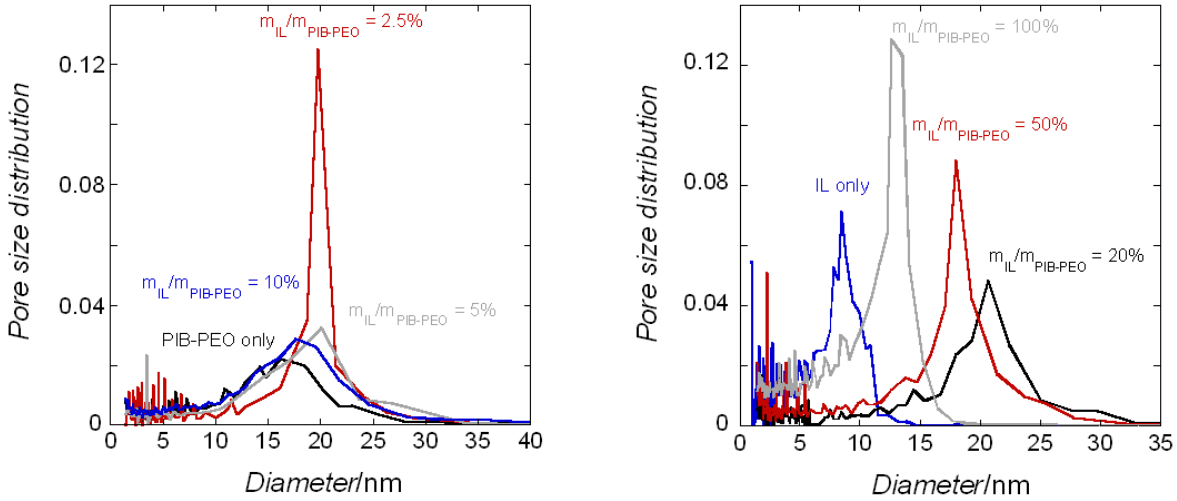


Fig. S3 Pore diameter distribution for mesoporous anatase films templated with PIB-PEO and/or IL, Calculated from the water-adsorption branch of the corresponding isotherm from Figure 4a.

The EEP detects characteristic pore sizes for each template when the templates are used separately to form monomodal films. Surprisingly, only one pore size is detected by EEP (Figure S3), while two types of pores are clearly identified on the SEM image (Figure 3). One can noticed that bimodal PSD calculation using EEP were already described in the literature, as example, Bellino et al. identified two sizes of pores produced by two different block polymers but the pore morphologies were similar and pore size really different (10 and up to 35 nm). In our present materials, the difference in the size of the pore is 10-12 nm maximum; it corresponds to the broadness of the pore size distribution for almost all samples templated with the block polymer PEO-PIB (only or combined with IL). Moreover the shapes of the different type of pores are really different. The worm-like mesopores are non-oriented and possess a high tortuosity, their contribution to the orthogonal contraction of the film is different than the ellipsoidal mesopores. The EEP can hardly determine a precise PSD for each type of pores as no established model exist for the present case. However the EEP is a powerful tool to estimate accurately the average pore size variation and the total pore volume of our films.

1 M. G. Bellino, I. Troppper, H. Duran, A. E. Regazzoni, G. J. A. A. Soler-Illia, *Small*, 2010, **6**, 1221.

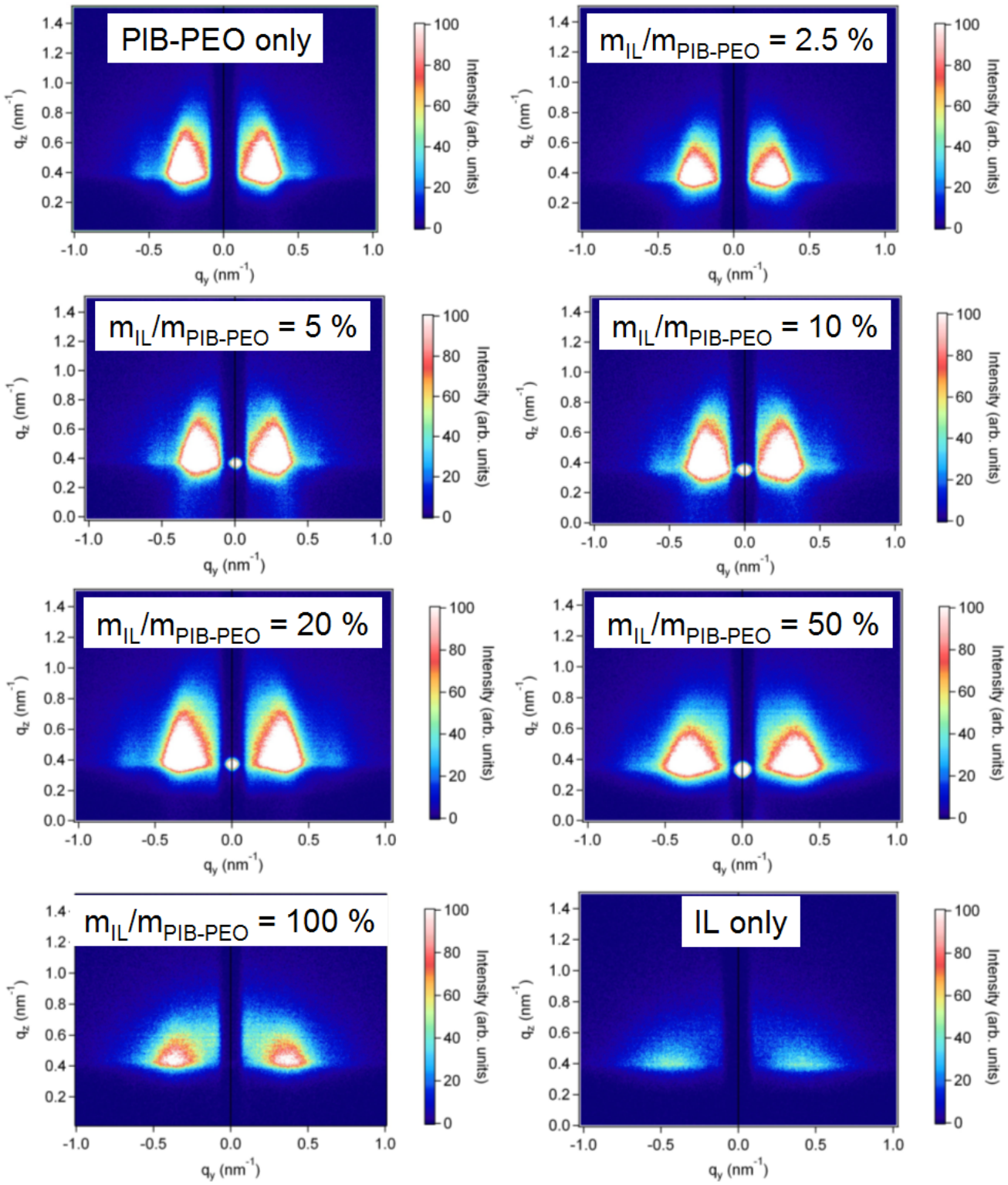


Fig. S4 2D-GISAXS images of the anatase mesoporous films.

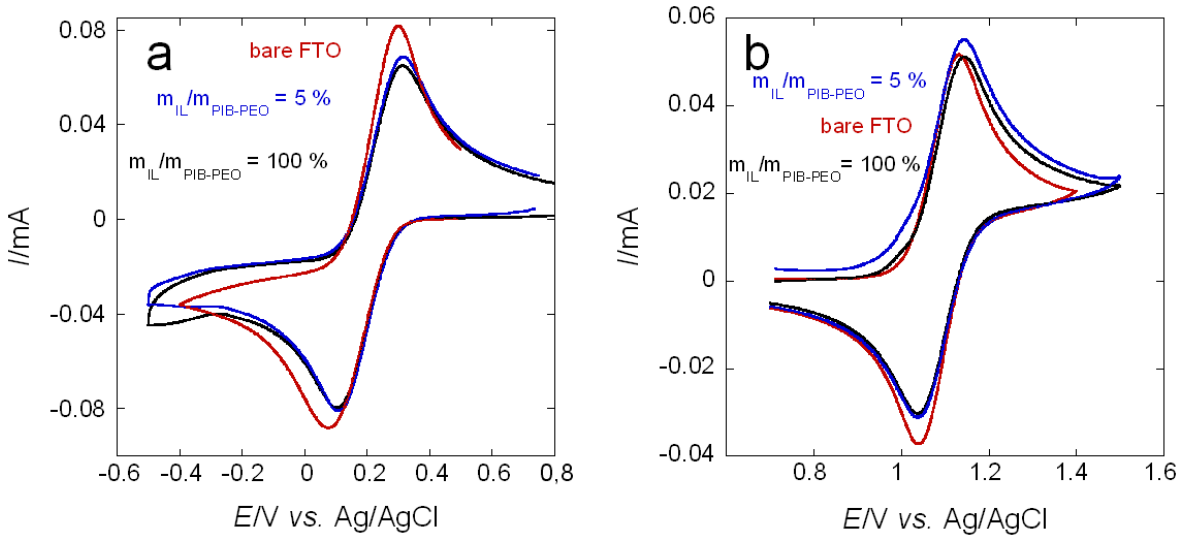
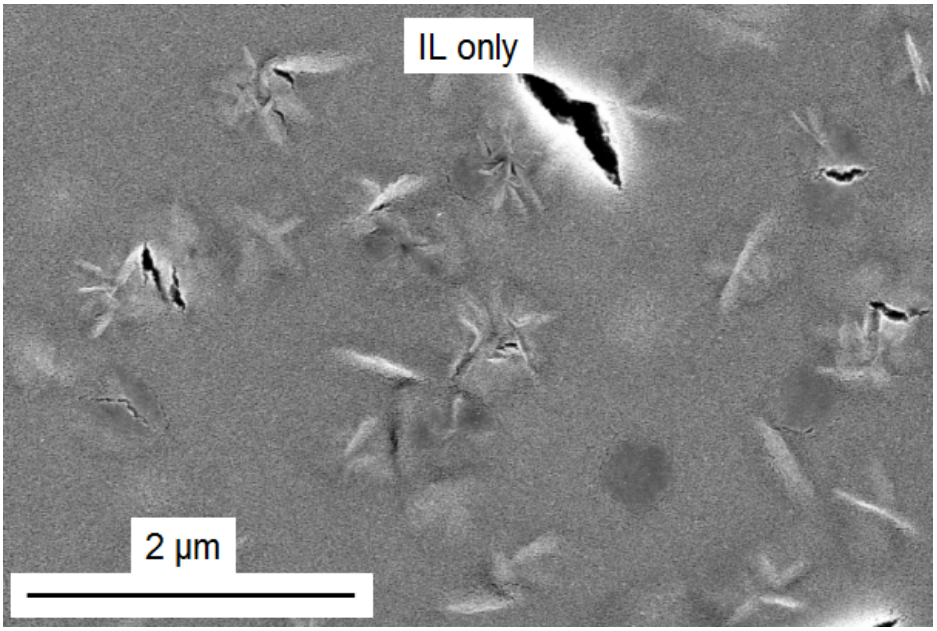
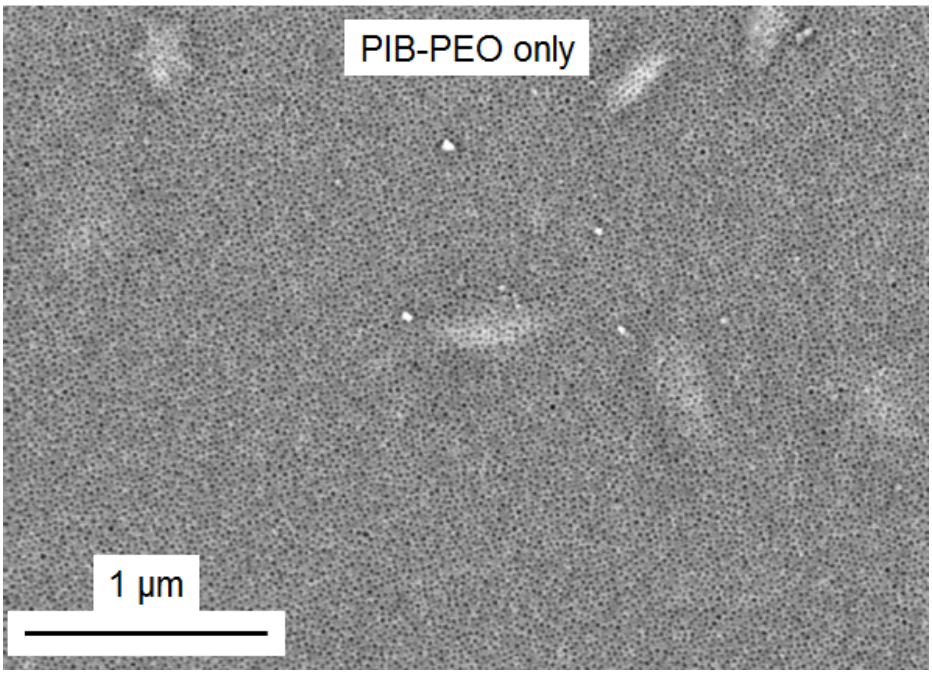
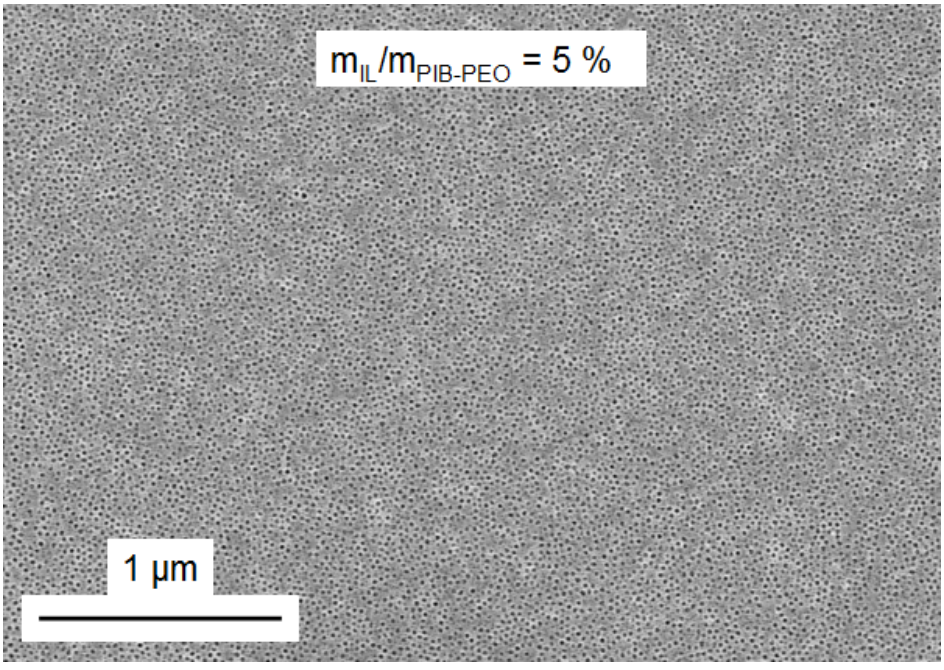


Fig. S5. Cyclic voltammetry with $K_3Fe^{III}CN_6$ (a) and $Ru(bpy)_3^{2+}$ (b) on bare FTO bare electrode (red) and mesoporous anatase films (~ 240 nm thick).







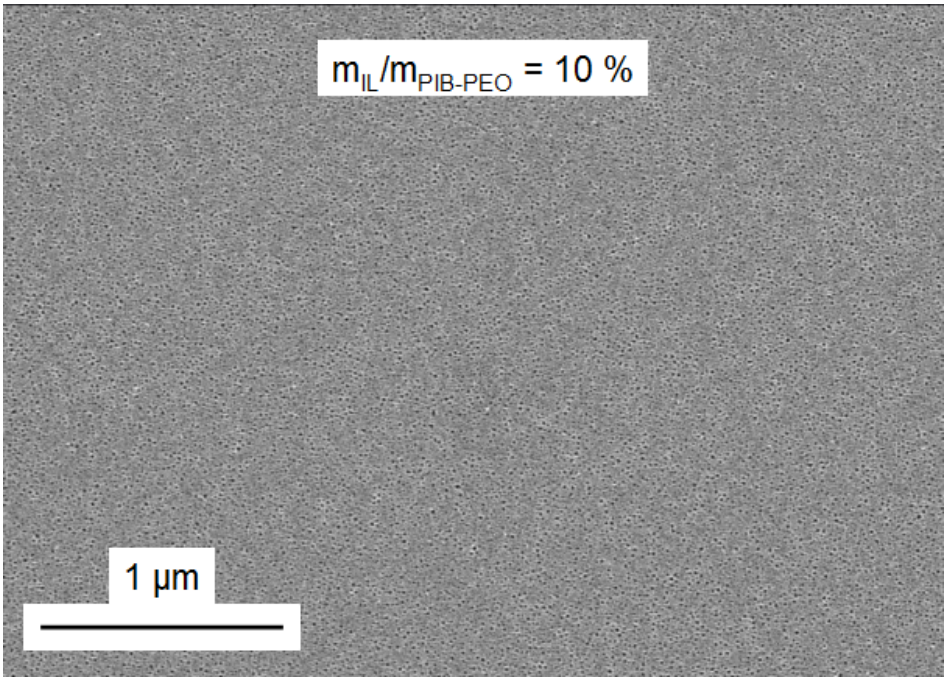


Fig. S6 Top-view SEM images of images of anatase-TiO_2 mesoporous films (> 200 nm thick).