

# Photochromic textiles based upon aqueous blends of oxygen-deficient $\text{WO}_{3-x}$ and $\text{TiO}_2$ nanocrystals

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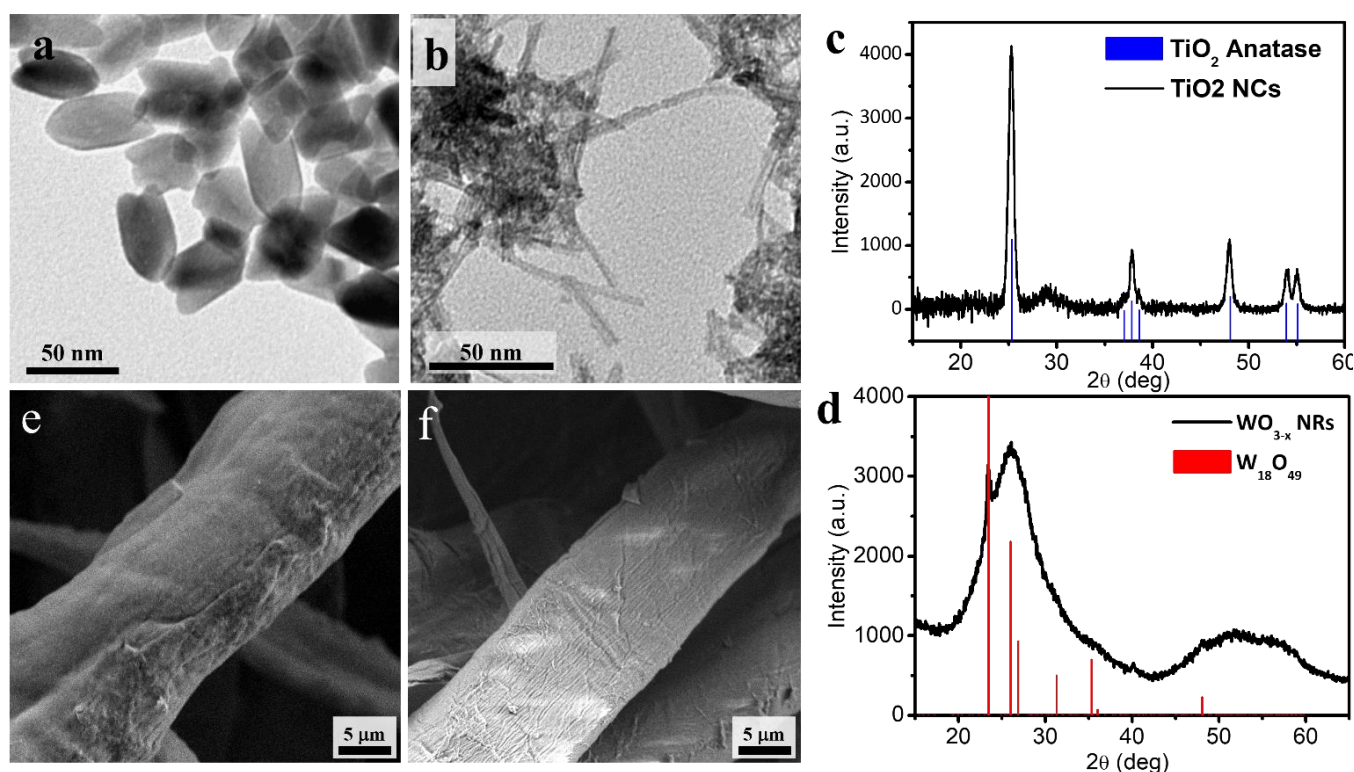
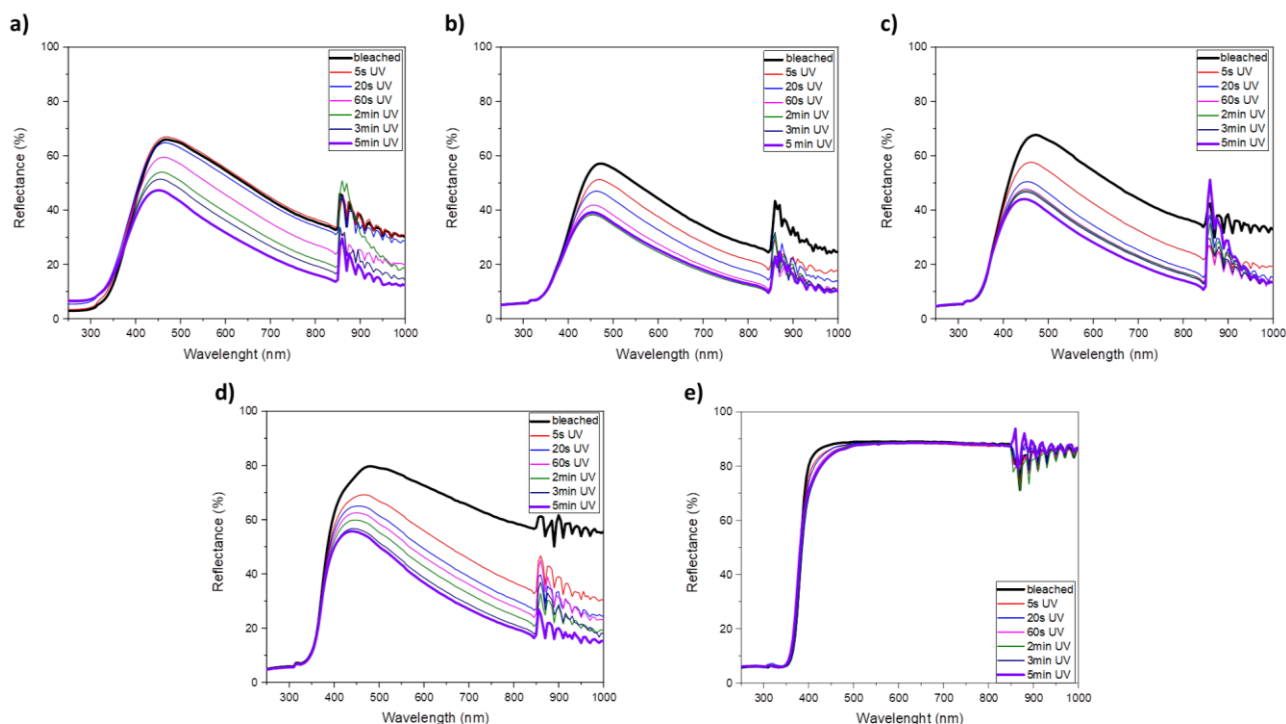
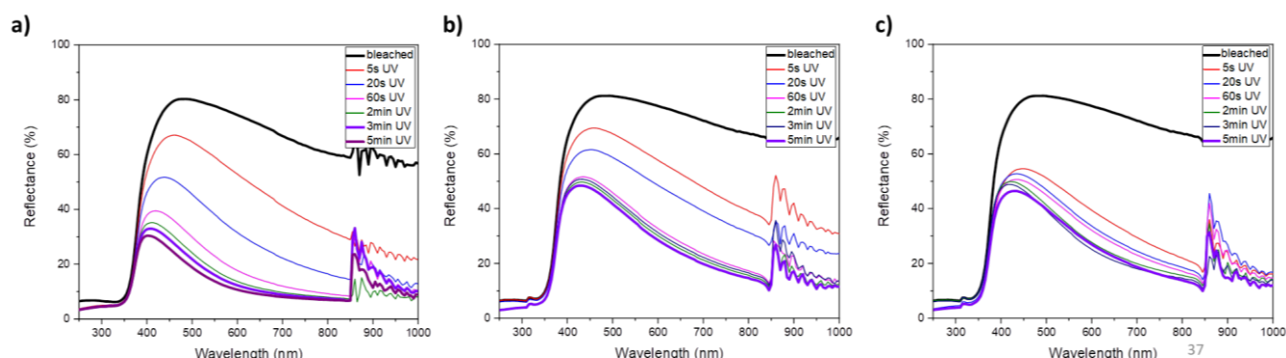


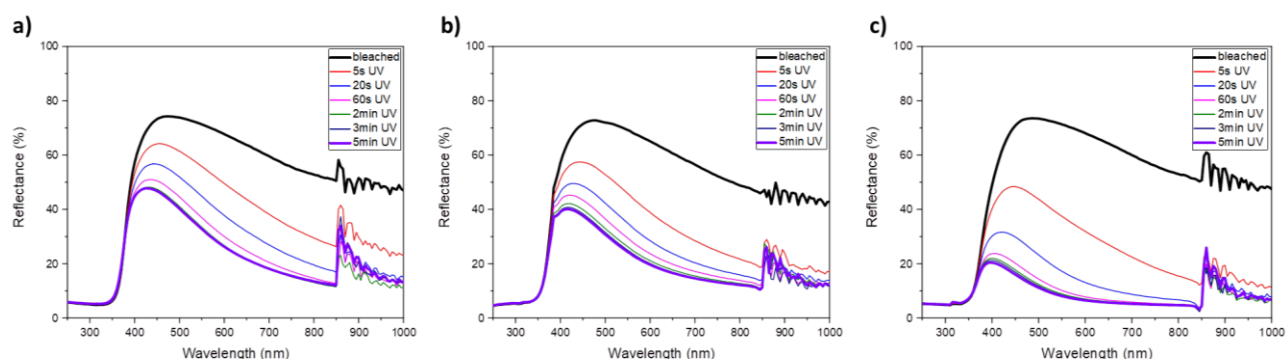
Figure S1: TEM of (a) TiO<sub>2</sub> seeds and (b) WO<sub>x</sub> nanorods; XRD diffraction pattern of as-synthesized (c) TiO<sub>2</sub> NCs (reference pattern of TiO<sub>2</sub> anatase ICSD code #9852) and (d) WO<sub>3-x</sub> NCs (reference pattern of W<sub>18</sub>O<sub>49</sub> anatase ICSD code # 080057); SEM pictures of (e) textiles functionalized with NCs solution prepared with WO<sub>3-x</sub> : TiO<sub>2</sub> ratio of 25% and (f) pristine textile



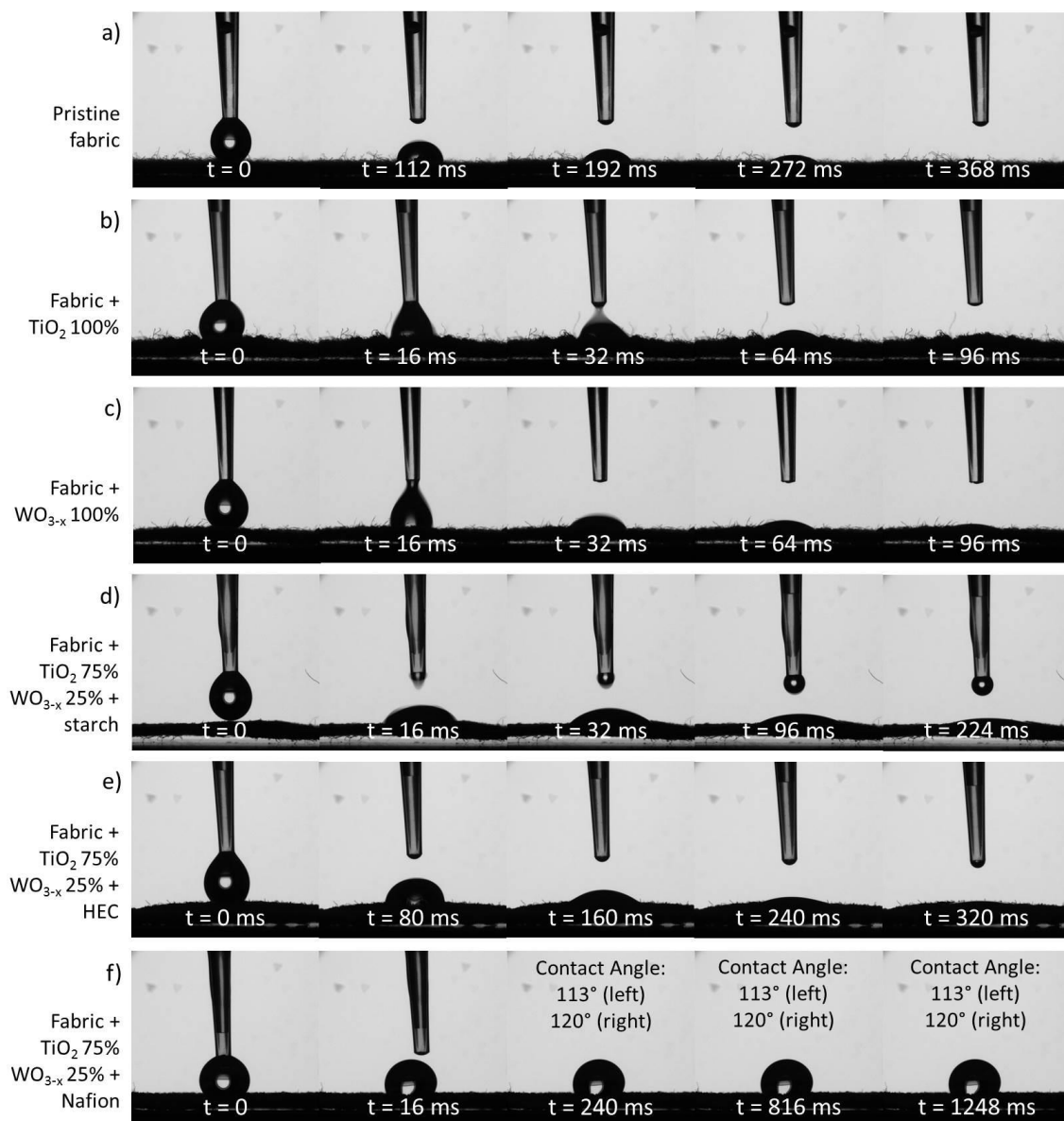
**Figure S2:** Reflectance spectra of NCs impregnated textiles in the bleached state and for different UV irradiation times: (a) 100%  $\text{WO}_{3-x}$ ; (b) 75%  $\text{WO}_{3-x}$ ; (c) 50%  $\text{WO}_{3-x}$ ; (d) 25%  $\text{WO}_{3-x}$ ; (e) 0%  $\text{WO}_{3-x}$ .



**Figure S3:** Reflectance spectra of  $\text{WO}_{3-x}:\text{TiO}_2$  (1:3) (25%  $\text{WO}_{3-x}$ ) impregnated textiles soaked with different solvents, in the bleached state and for different UV irradiation times: methanol (a); ethanol (b); 2-propanol (c).



**Figure S4:** Reflectance spectra of  $\text{WO}_{3-x}:\text{TiO}_2$  (1:3) (25%  $\text{WO}_{3-x}$ ) impregnated textiles over-coated with different polymeric matrices, in the bleached state and for different UV irradiation times: starch (a); hydroxyethylcellulose (b); nafion (c).



**Figure S5.** Contact angle measurements on functionalized fabrics. a) pristine fabric; fabrics functionalized with b)  $\text{TiO}_2$  100% and c)  $\text{WO}_{3-x}$  100%; in these three cases, the highly hydrophilic substrate rapidly adsorbs the drop in less than few hundred milliseconds, and therefore it is not possible to evaluate the contact angle. The presence of  $\text{TiO}_2$  (b) or  $\text{WO}_{3-x}$  (c) nanocrystals increases the surface wettability, speeding up the drop adsorption, which take place in less than 100 ms, also for the other  $\text{TiO}_2$ : $\text{WO}_{3-x}$  combinations (not reported here). When the fabric is treated with d) corn starch and e) HEC, the hydrophilic nature of the two polymers leads to a behavior similar to the previous ones, but with slightly longer absorption times (a few hundreds of ms); also in this case it is not possible to measure the contact angles. Instead, in the case of Nafion (f), a fluoropolymer, the fabric acquires a good hydrophobicity, with slightly asymmetrical left-right contact angles due to the surface morphology of the fabric.