Structural, optical and photocatalytic properties of erbium (Er^{3+}) and yttrium (Y^{3+}) doped TiO_2 thin films with remarkable self-cleaning super-hydrophilic properties

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Supplementary material

We have previously determined the UV-vis spectra of the Y^{3+}, Er^{3+} and bare TiO_2 samples (not shown in the manuscript) (see Fig S1).

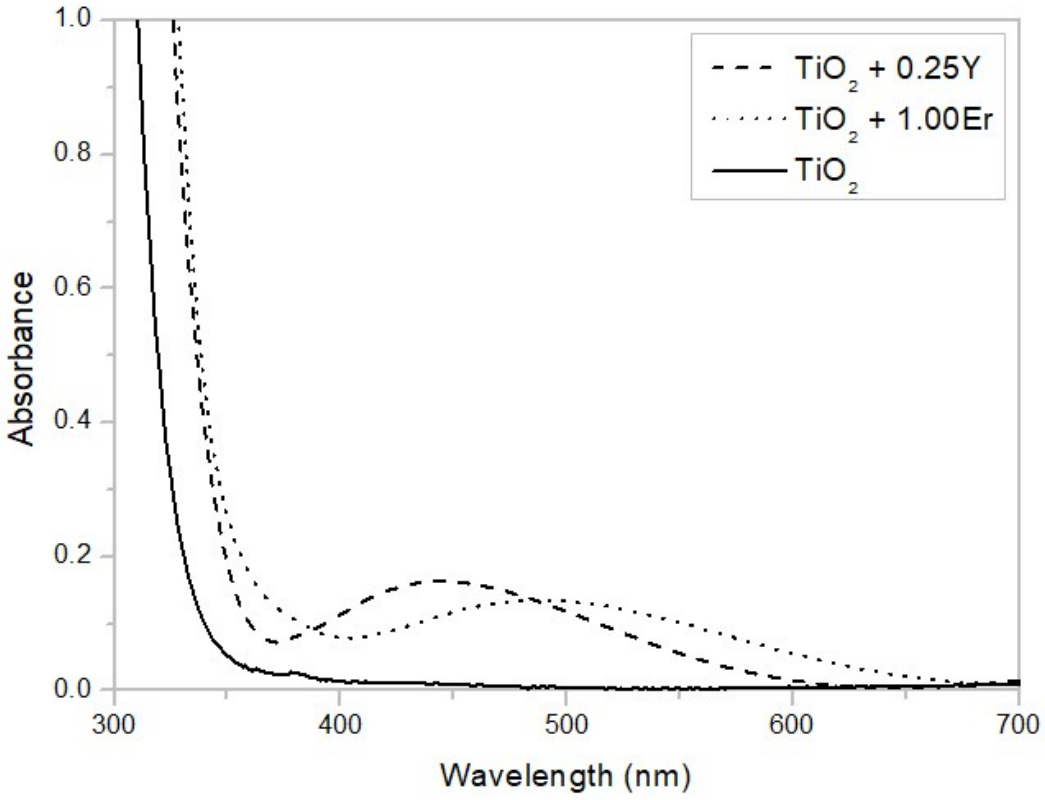

Fig S1 – UV-vis spectra of bare TiO_2 and doped Y (0.25 %) and Er (1.00%) TiO_2.

The undoped TiO_2 exhibited absorption only in the UV region. The absorption spectra of the doped samples showed a clear red shift compared with that of bare TiO_2, suggesting that Y^{3+} and Er^{3+}doped samples could also present visible light self-cleaning properties. The spectrum of doped Er^{3+}-TiO_2 showed a red shift in the band gap

transition, that has been ascribed to a charge transfer transition between TiO_2 and Er^{3+} intra-4*f* electrons (Casteñada-Contreras et al., 2012).

The absorption edge of the sample shifts toward shorter wavelength after the Y doping. The Y^{3+} doping in TiO_2 samples cause the formation of oxygen vacancies and Ti^{3+} in TiO_2 (Gao et al., 2012), and Ti^{3+} results in the occupied states of Ti 3d and the up-shift of fermi level, and so the optical band gap of TiO_2 is broaded (Zhang et al., 2011).

However, from our best understanding, although it is an important result, no additional evidence can be deduced from these results to further demonstrate the self-cleaning and photocatalytic activity under UVA irradiation, according to the ISO 27488 test.

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