Electronic Supplementary Material (ESI) for New Journal of Chemistry.
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Preparation of tungstophosphoric acid/cerium-doped UiO-66 Z-scheme photocatalyst: A new candidate for green photo-oxidation of dibenzothiophene and quinoline using molecular oxygen as oxidant

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Characterization

X-ray diffraction (XRD) patterns were recorded on Philips X-pert X-ray diffractometer using Cu Kα radiation (wavelength, λ = 1.5418 Å). Scanning electron microscopy (SEM) and energy-dispersive X-ray (EDX) spectroscopy were conducted on Philips XL-300 instrument. Transmission electron microscopy (Philips cm 30) was used to assay morphological features. Shimadzu-8400S spectrometer was used to acquire Fourier-transform infrared (FT-IR) spectra of the synthesized samples. A gas chromatograph (GC) coupled with a flame ionization detector (GC-FID (HP5890, Agilent)) was used to monitor the concentration of pollutant model. The percentage of Ce was determined by inductively coupled plasma mass spectrometry (ICP-MS) (Varian vista PRO instrument) analysis. The photoluminescence (PL) spectra were recorded using A PELS-55 Luminescence/Fluorescence spectrophotometer.

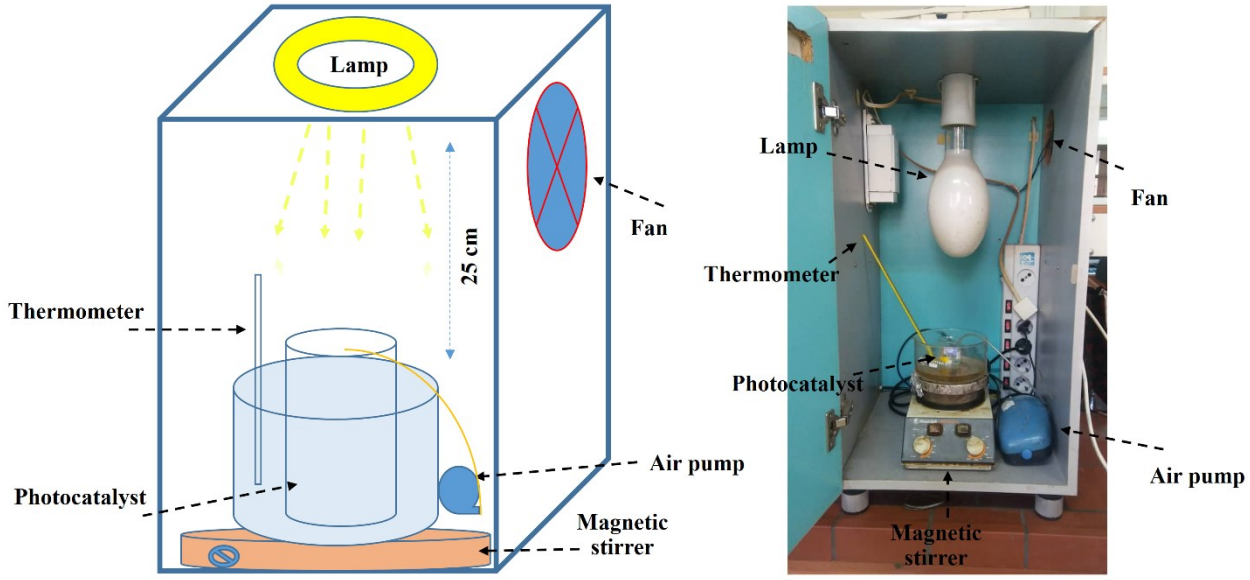

Fig. S1. Scheme of the photocatalytic system (a) and real picture of the photocatalytic box (b)

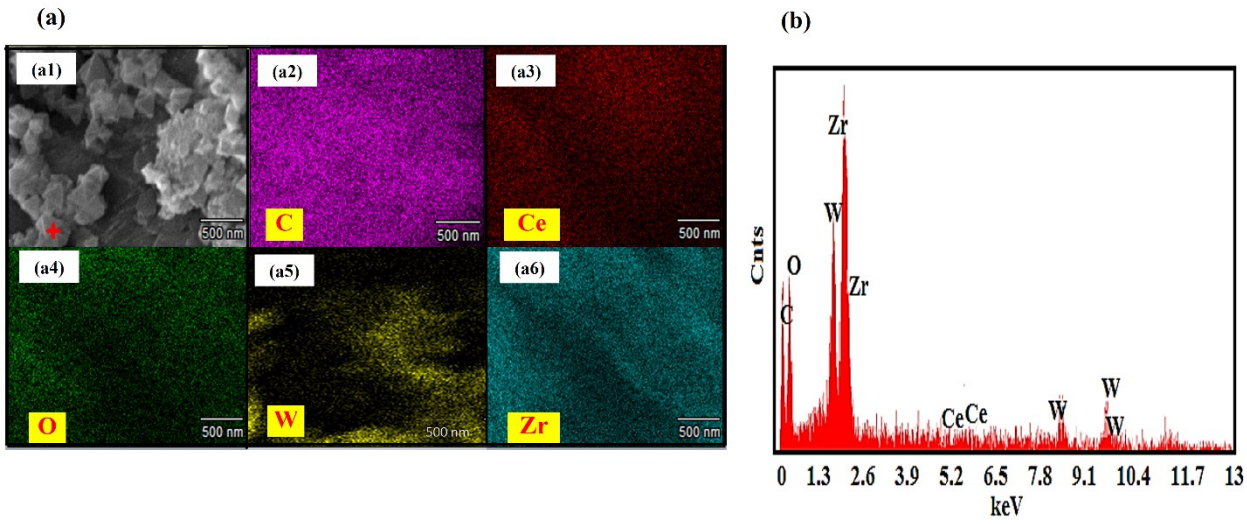

Fig. S2. (**a**) Mapping analysis of PW_{12}/Ce-NUiO-66, (a1) Original image of the region where the mapping was performed, element mapping images of (a2) carbon, (a3) cerium, (a4) oxygen, (a5) tungsten and (a6) zirconium; (**b**) EDAX spectrum of PW_{12}/Ce-NUiO-66.

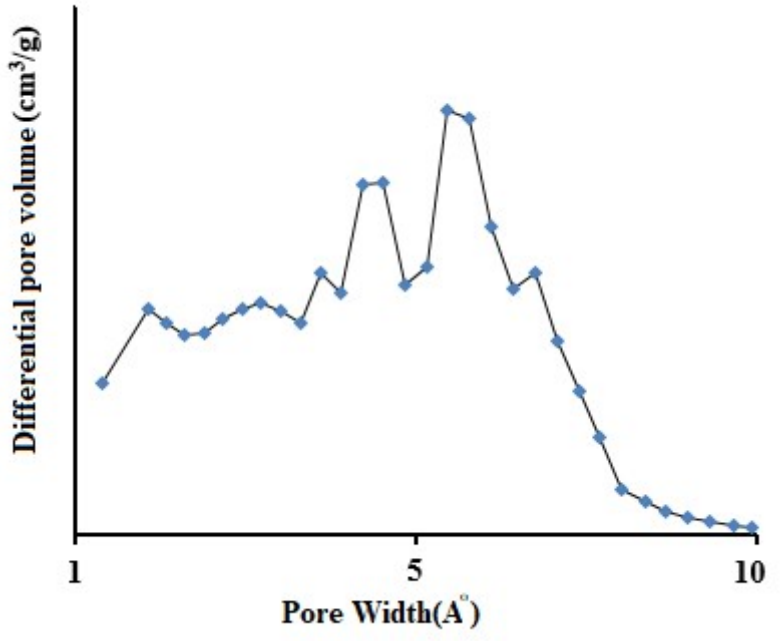

Fig. S3. Density functional theory pore size distribution profiles of $30PW_{12}$/Ce-NUiO-66.

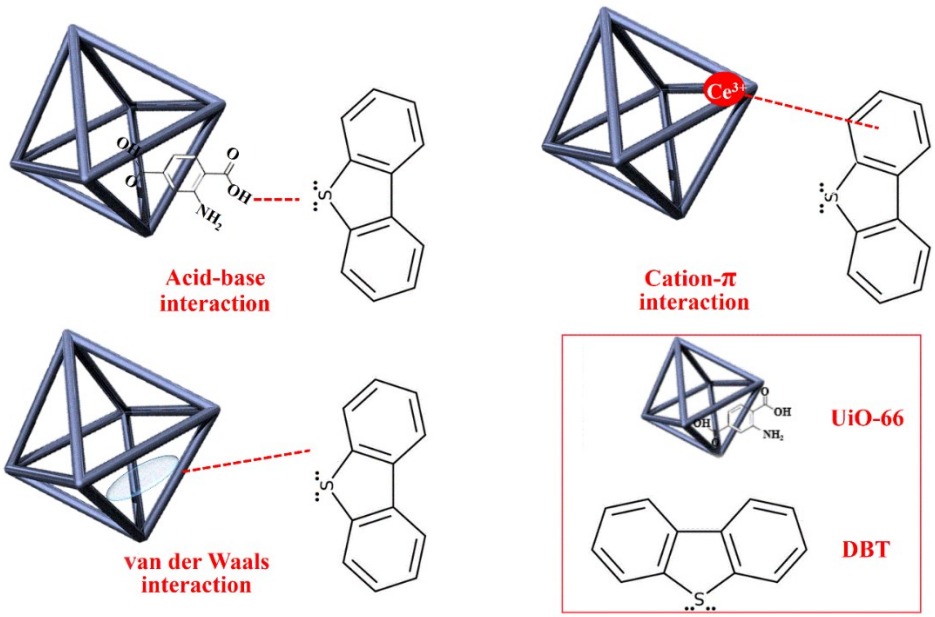

Fig. S4. The proposed interactions involved for DBT adsorption.

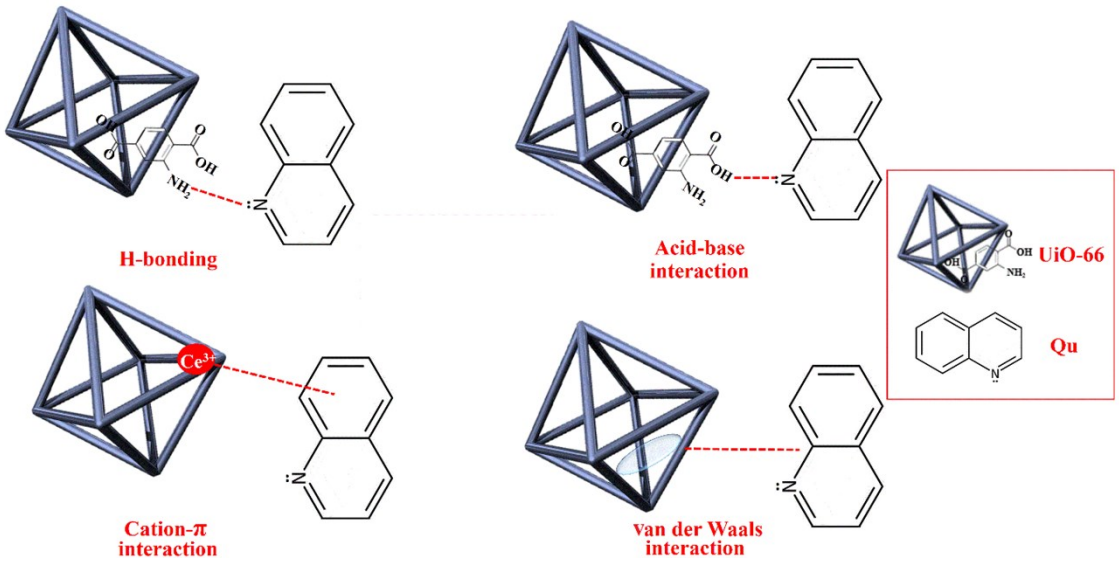

Fig. S5. The proposed interactions involved for Qu adsorption.

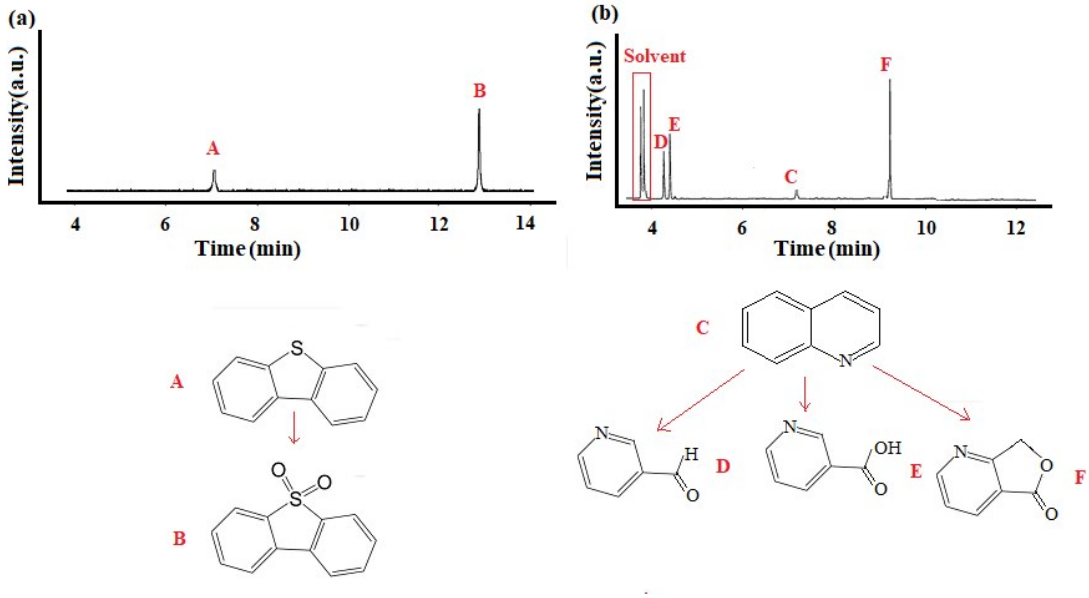

Fig. S6. GC chromatograms after 45 min photo-oxidation of (**a**) DBT and (**b**) Qu (b); Chemical structures of A: dibenzothiophene; B: dibenzothiophene sulfone; C: quinolone; D: nicotinaldehyde; E: nicotinic acid; F: 7-methyl furo [3,4-b]pyridin- 5(7H)-one

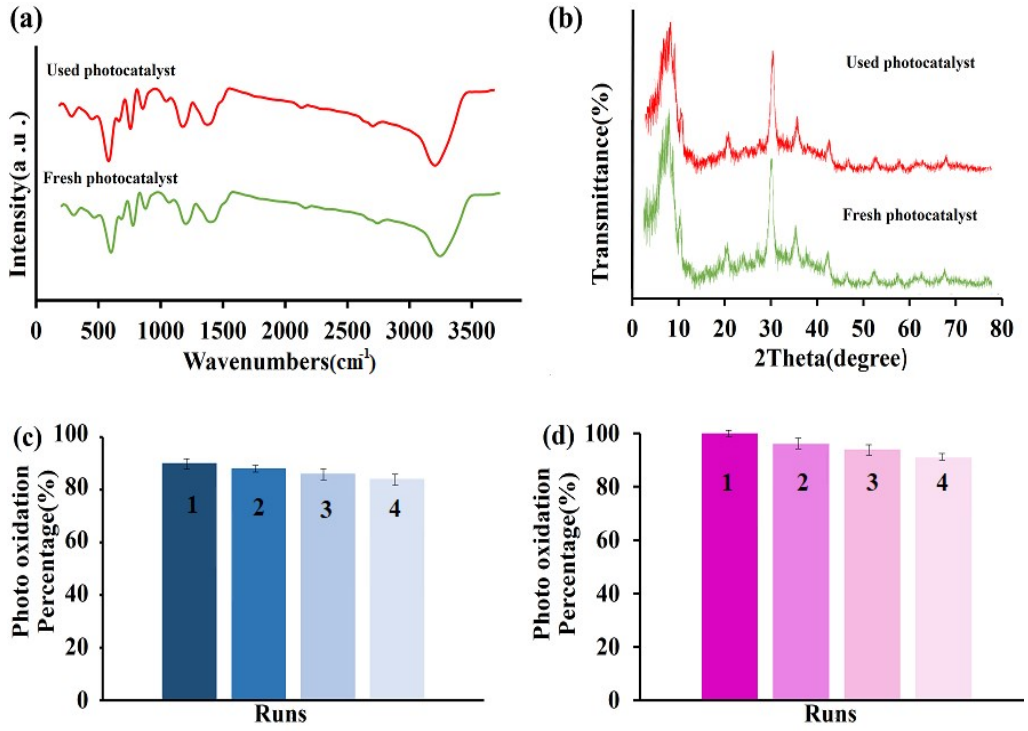

Fig. S7. (**a**) FTIR spectra and (**b**) XRD patterns of the fresh and recycled photocatalysts; Photocatalytic efficiency for (**c**) DBT and (**d**) Qu after four consecutive cycles.