Supplementary Information File

Hybrid noble-metals/metal-oxide bifunctional nano-heterostructure displaying outperforming gas-sensing and photochromic performances

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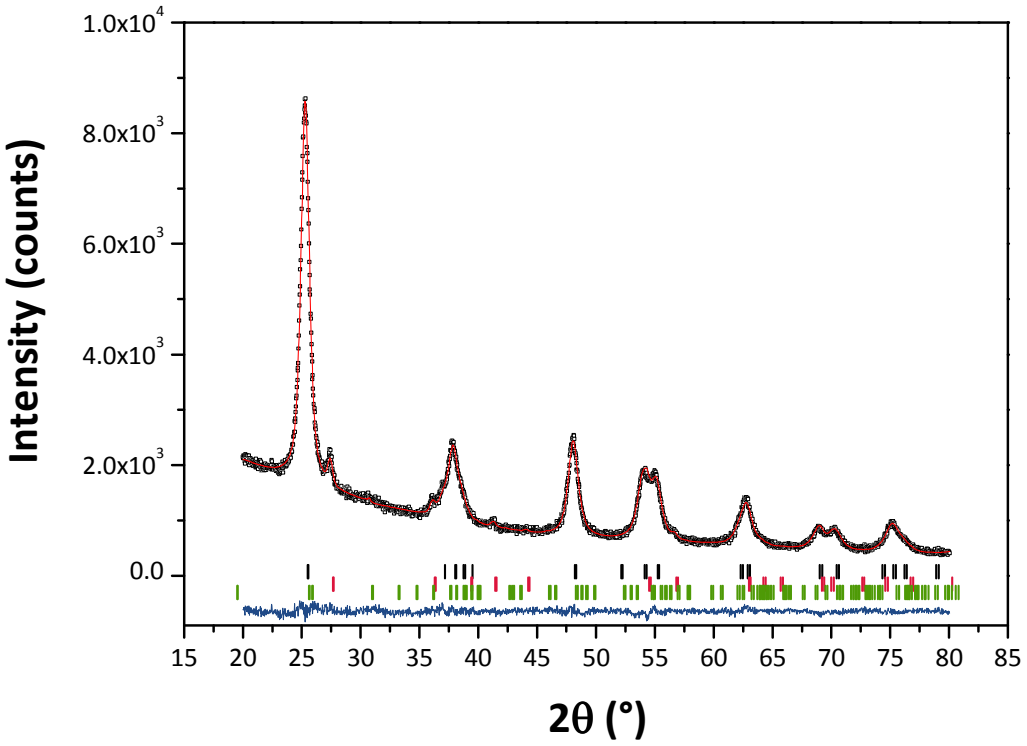
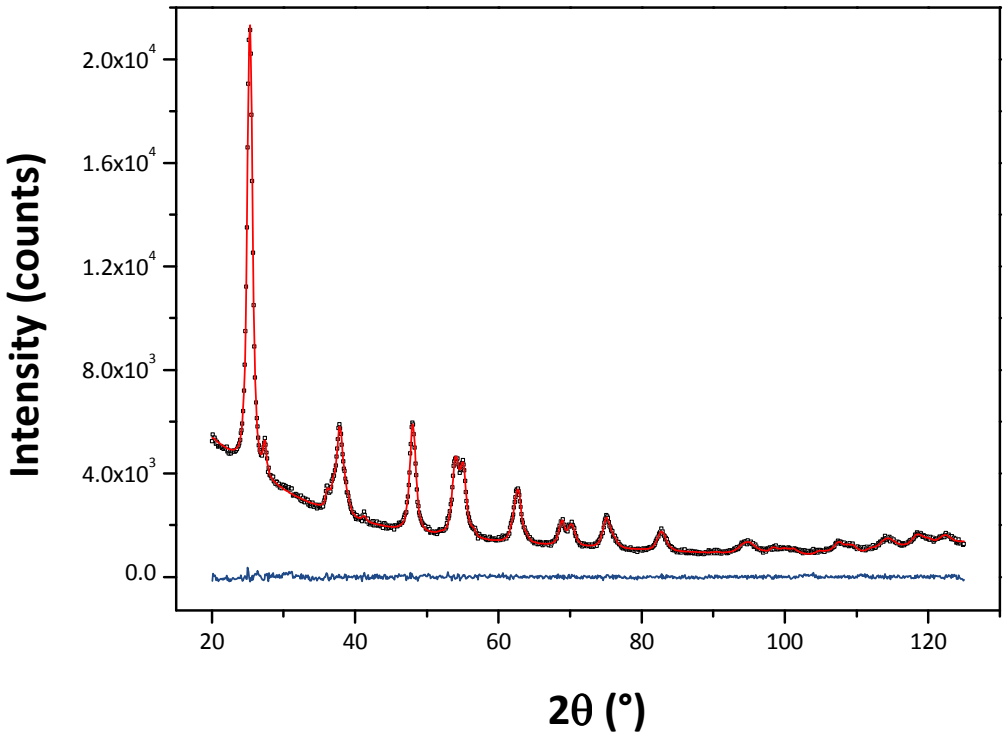
Figure S1



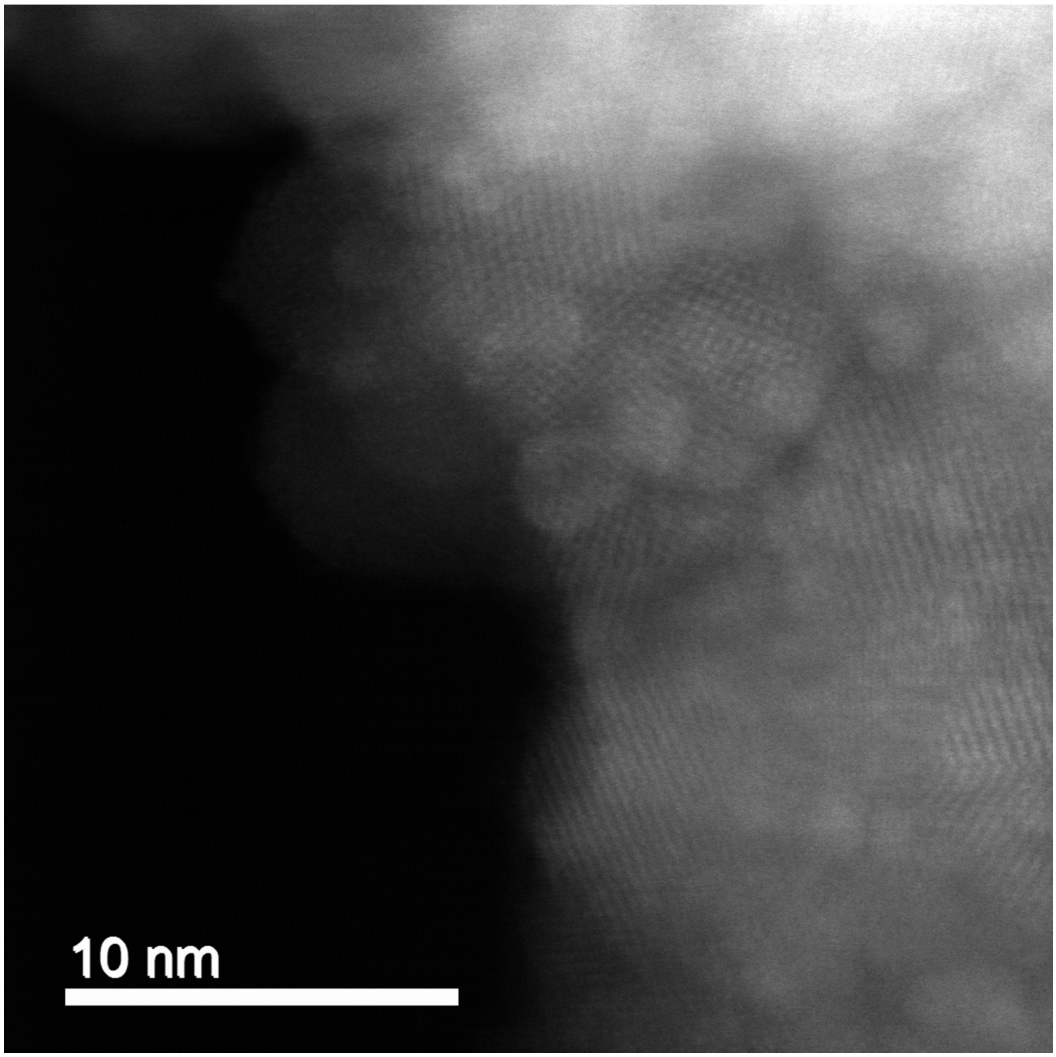
Graphic output of the Rietveld refinement of the sample **SBC1**. The red line represents the calculated pattern, the black open squares represent the observed pattern, and the difference curve between observed and calculated profiles is plotted below. The position of reflections is indicated by the small vertical bars (black: anatase; red: rutile; green: brookite).

Figure S2



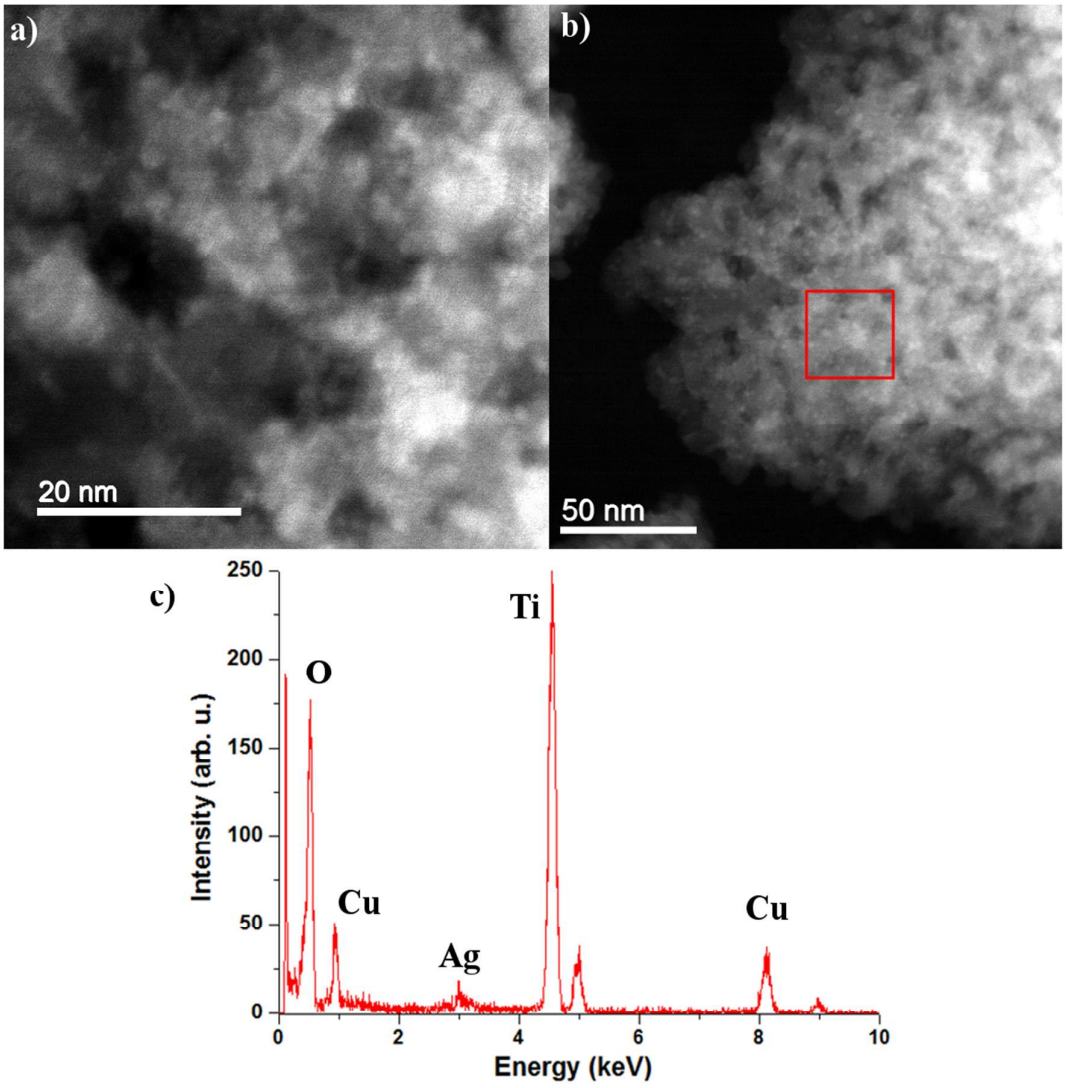
Graphic output of the WPPM modelling of **SBC1** (black open squares are observed data, red continuous line the calculated data, and the lower blue continuous line is the difference curve between observed and calculated profiles).

Figure S3



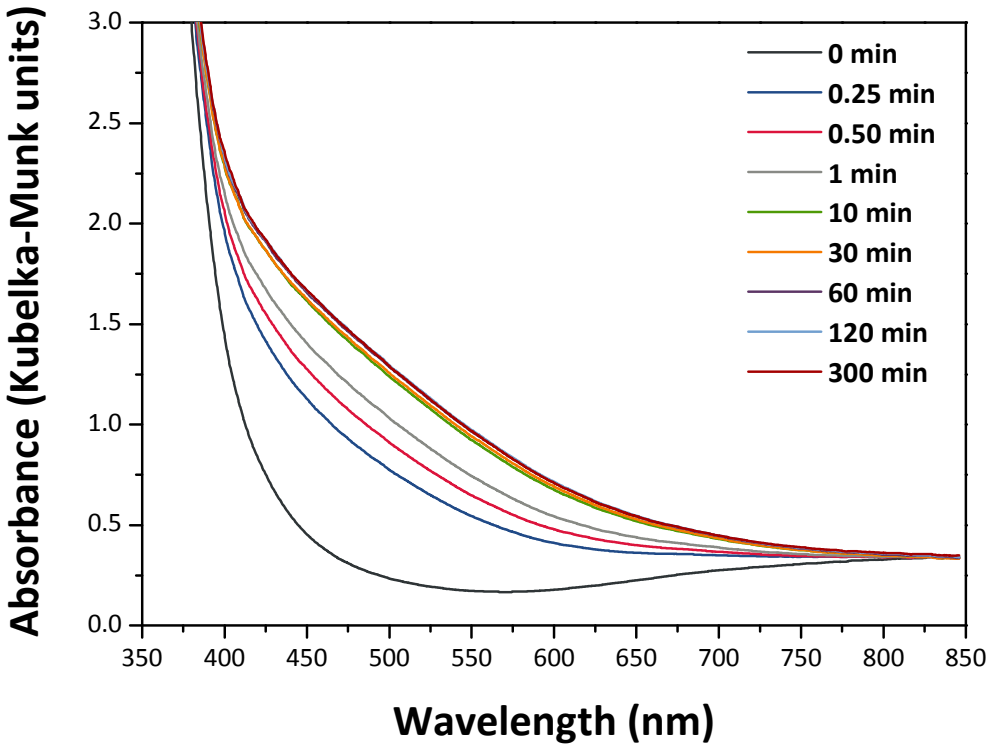
HR-STEM HAADF micrograph of TiO_2 NPs.

Figure S4



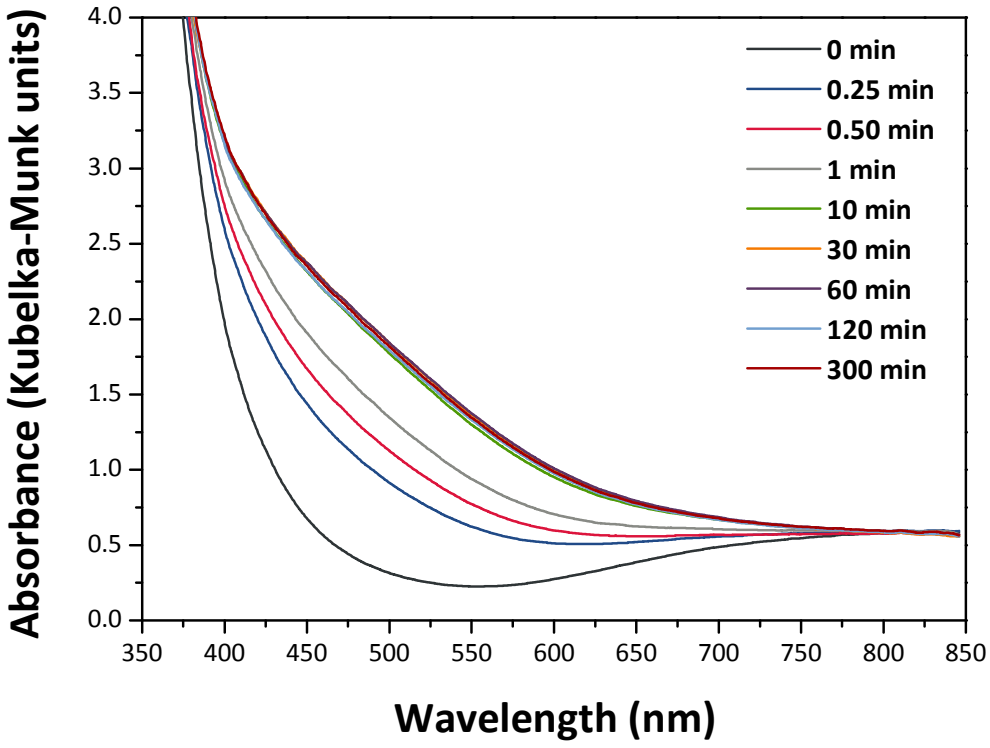
a) HR-STEM-HAADF micrograph of sample **SBC10**. b) Low magnification STEM-HAADF micrograph of the sample **SBC10**. The red square highlights the area used to acquire the EDS spectrum in c), rastering the beam in this region.

Figure S5a



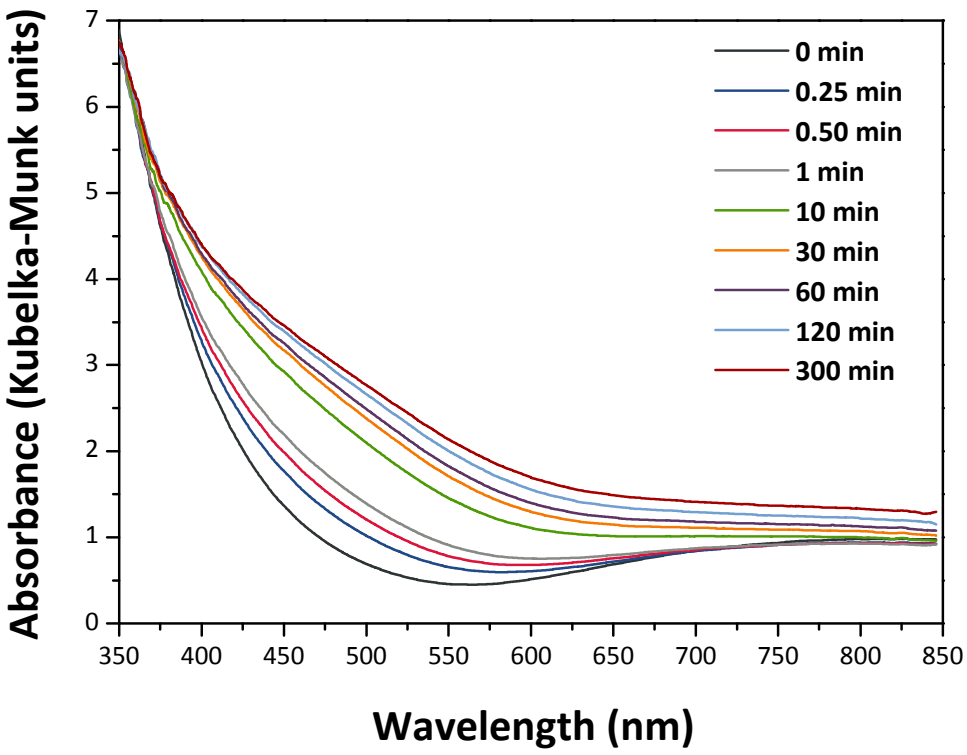
DRS spectra of sample **SBC1** irradiated with UVA-light for 0, 0.25, 0.50, 1, 10, 30, 60, 120 and 300 min.

Figure S5b



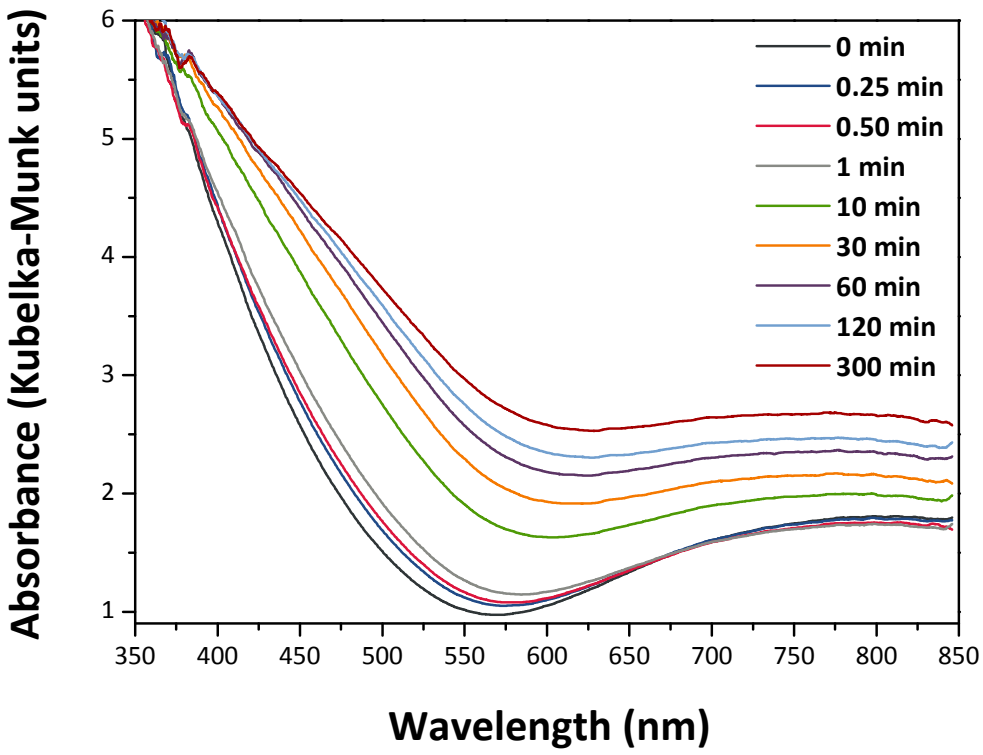
DRS spectra of sample **SBC2** irradiated with UVA-light for 0, 0.25, 0.50, 1, 10, 30, 60, 120 and 300 min.

Figure S5c



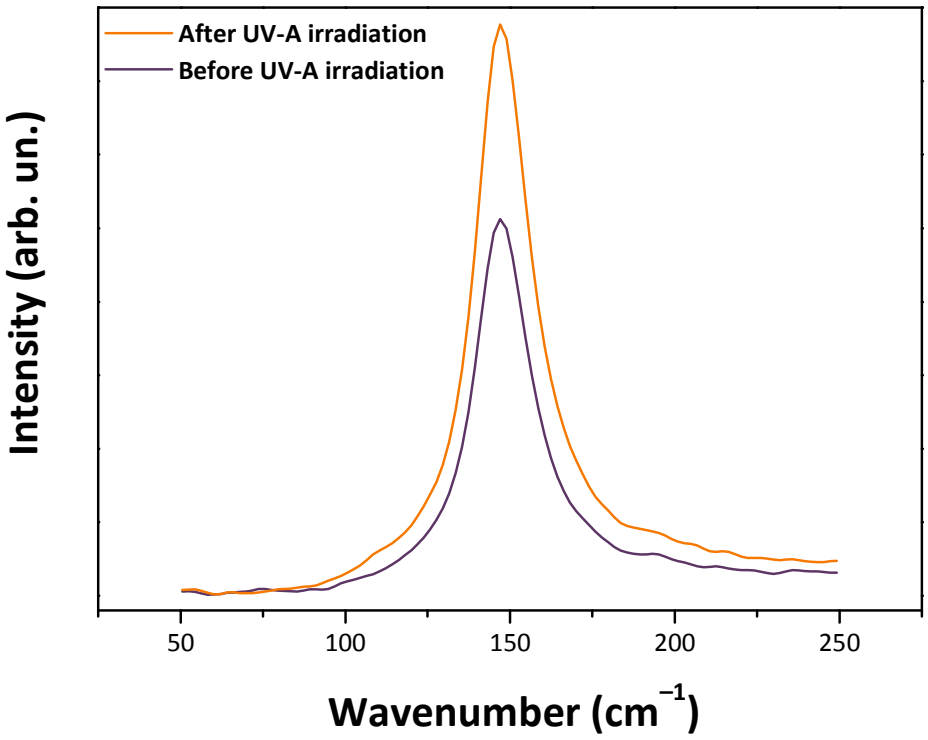
DRS spectra of sample **SBC5** irradiated with UVA-light for 0, 0.25, 0.50, 1, 10, 30, 60, 120 and 300 min.

Figure S5d



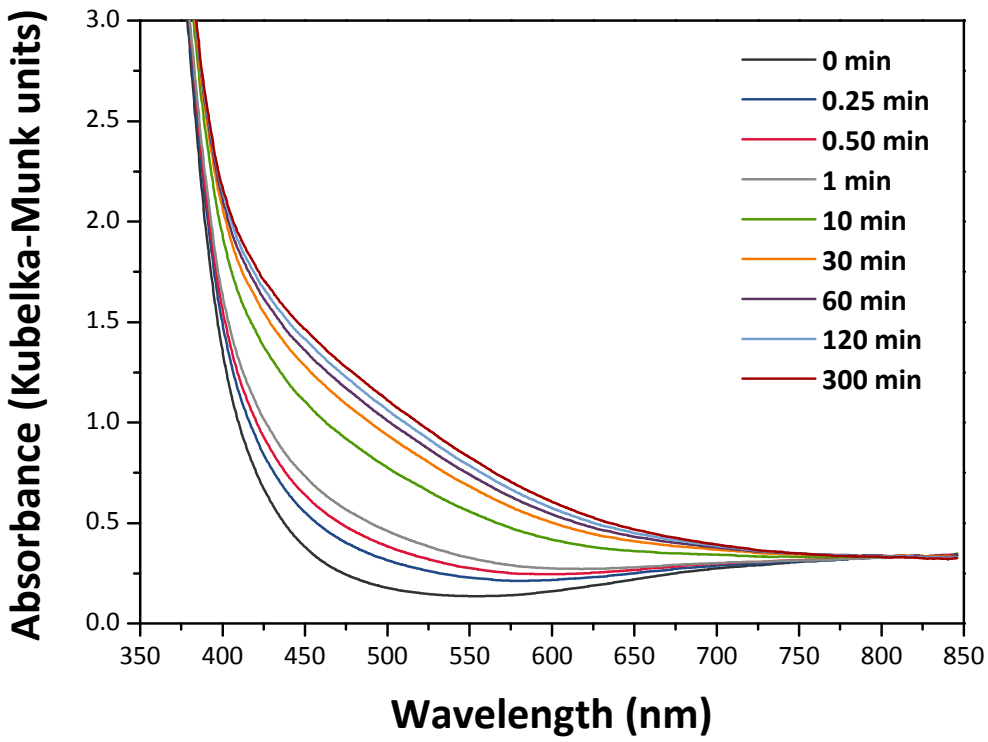
DRS spectra of sample **SBC10** irradiated with UVA-light for 0, 0.25, 0.50, 1, 10, 30, 60, 120 and 300 min.

Figure S6



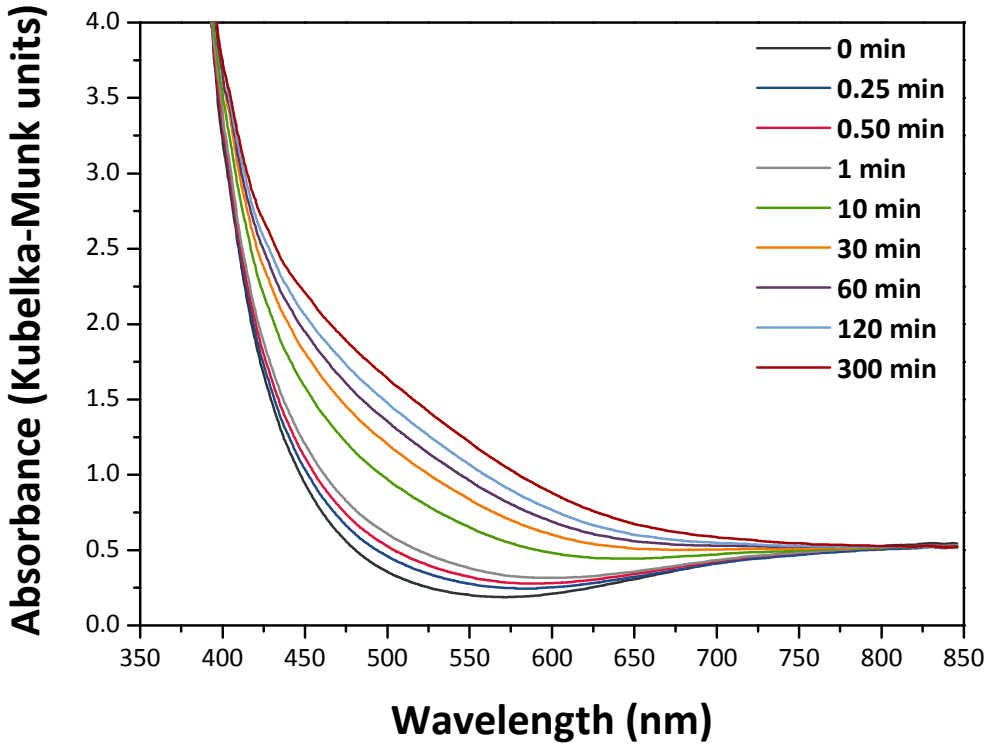
Raman spectra (in the 50–250 cm^{-1} wavenumber region, to highlight the Raman E_g mode of anatase) of un-irradiated **SBC5**, and of the same specimen after being irradiated for 300 min with the UV-A lamp.

Figure S7a



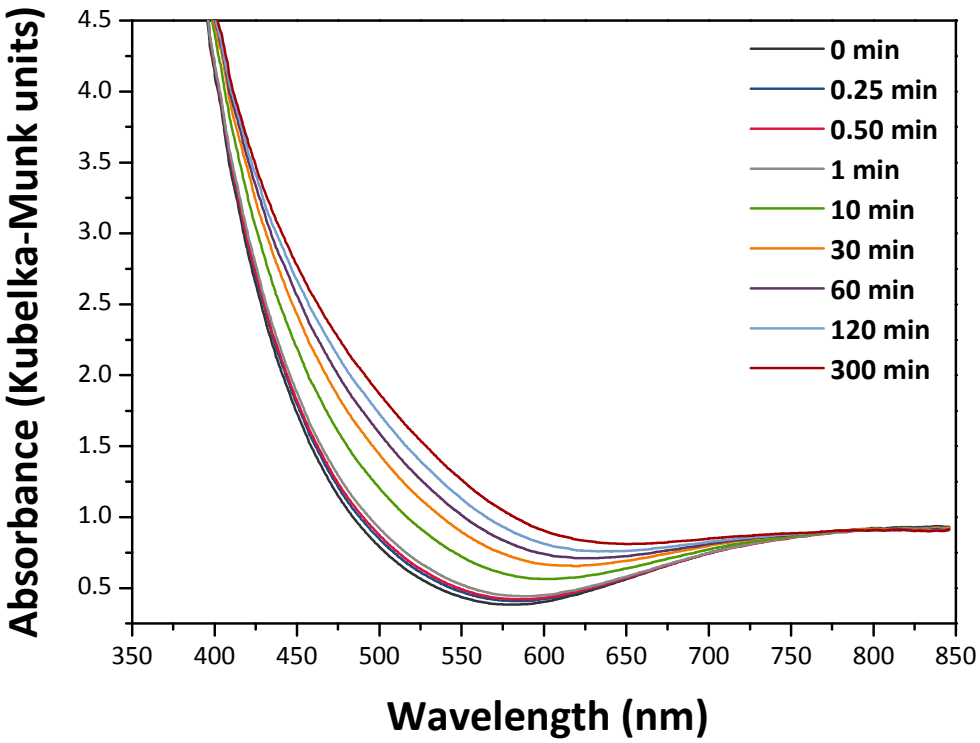
DRS spectra of sample **SBC1** irradiated with vis-light for 0, 0.25, 0.50, 1, 10, 30, 60, 120 and 300 min.

Figure S7b



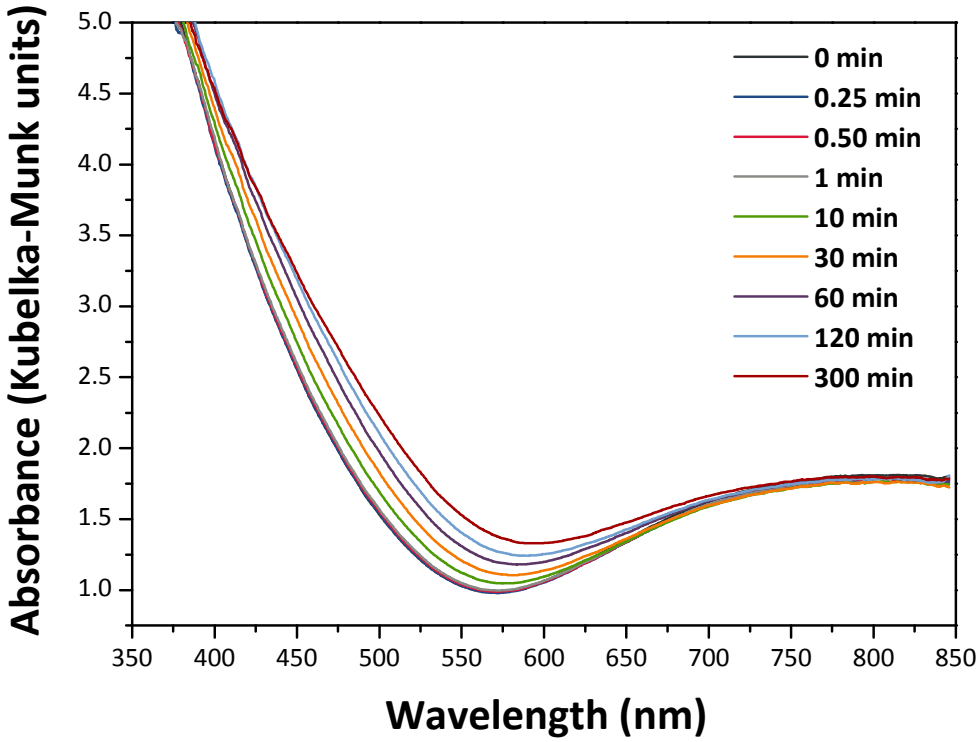
DRS spectra of sample **SBC2** irradiated with vis-light for 0, 0.25, 0.50, 1, 10, 30, 60, 120 and 300 min.

Figure S7c



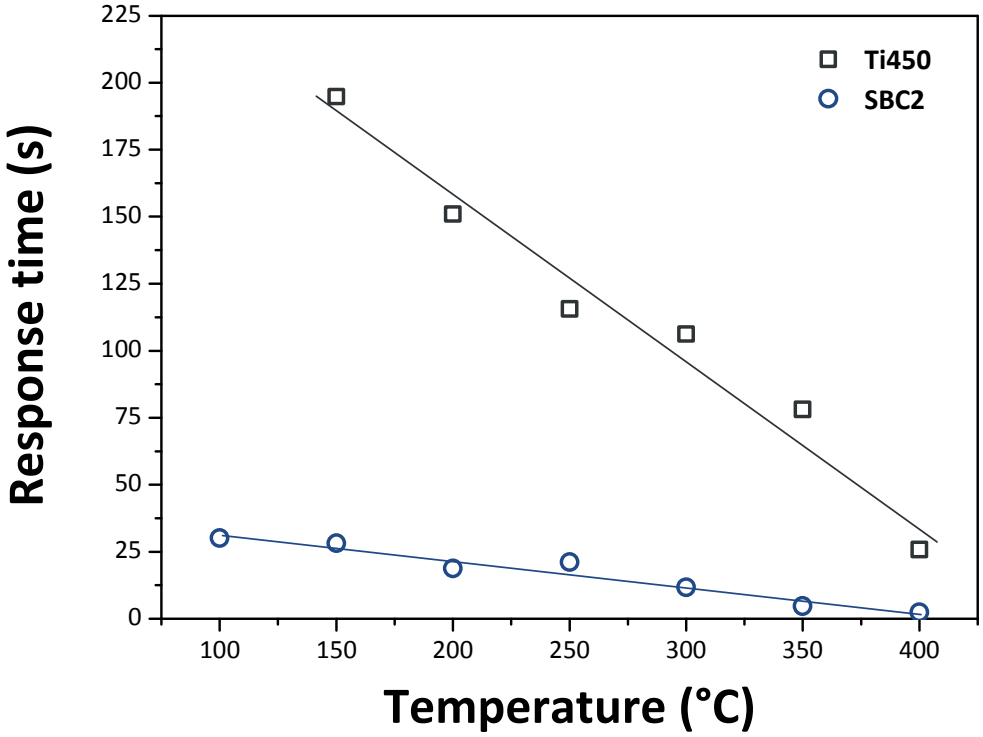
DRS spectra of sample **SBC5** irradiated with vis-light for 0, 0.25, 0.50, 1, 10, 30, 60, 120 and 300 min.

Figure S7d



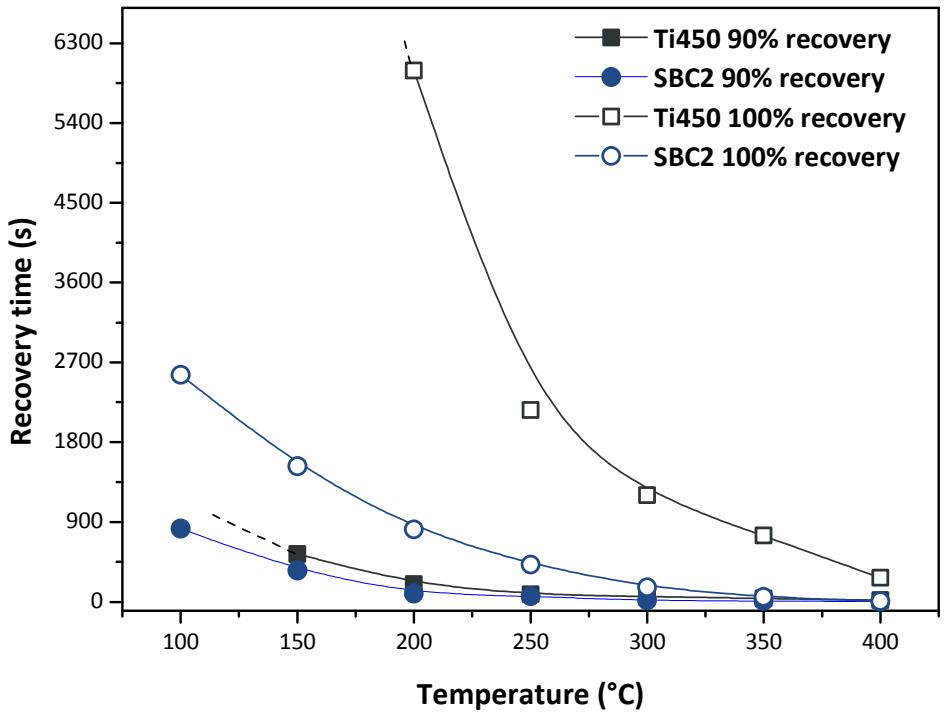
DRS spectra of sample **SBC10** irradiated with vis-light for 0, 0.25, 0.50, 1, 10, 30, 60, 120 and 300 min.

Figure S8a



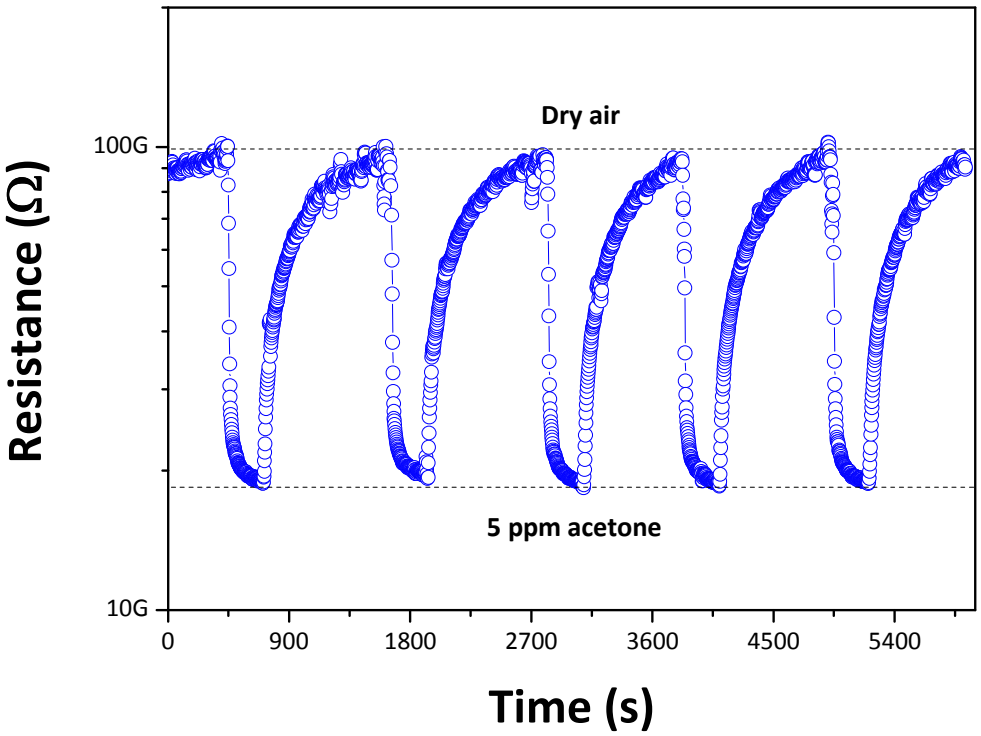
Response time at 90% signal variation as function of temperature towards 20 ppm acetone of **Ti450** and **SBC2** based sensors

Figure S8b



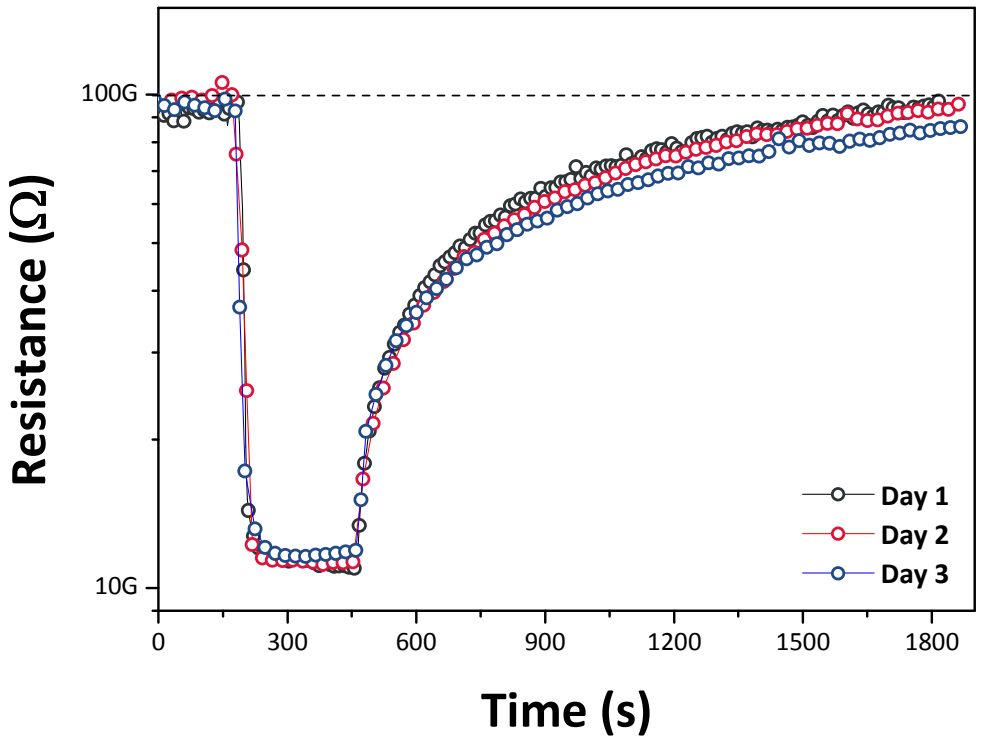
Recovery times at 90% and 100% of the baseline signal recovery respectively, as function of temperature after exposure to 20 ppm acetone of **Ti450** and **SBC2** based sensors

Figure S9a



Reproducibility of response during five consecutive exposures to 5 ppm of acetone in dry air of **SBC2** based sensor

Figure S9b



Reproducibility of response to 20 ppm acetone in dry air, recorded during three different days, of **SBC2** based sensor

Table S1 – Position and FWHM of Raman E_g mode of anatase.

	Anatase Raman E_g mode (cm^{-1})	
Sample	**Position**	**FWHM**
Ti450	145.1±0.1	15.4±0.6
SBC1	145.3±0.1	15.7±0.4
SBC2	146.3±0.1	16.9±0.4
SBC5	147.8±0.1	20.0±0.7
SBC10	148.1±0.1	21.4±0.8