Field Testing of Low-cost Titania-based Photocatalysts for Enhanced SODIS in Rural India – Electronic Supplementary Information

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Water Sources for Testing

Further photos of water sources used throughout this study:

*Figure S2- View when standing next to **W1P**, showing dry terrain and livestock*

*Figure S1 - **W1P** opening*

*Figure S3 - Inside of well **W2B***

*Figure S4 - **W2B**, shown in a clearing of the village*

*Figure S5 - the tap used to obtain water on the IIT KGP campus (**CW**)*

*Figure S6 - Tube well (**TW**), shown in the red circle. The toilet block is seen behind the pump, labelled 'A', with the agricultural land seen through the trees, labelled 'B', and the pond, with an algal film, labelled 'C'*

*Figure S7 - The government-controlled water pump (**STW**), shown here being used by a child*

Solid Content Parameters - TDS, Salt and Conductivity

Table S1. Average values and standard error of physicochemical properties of the water samples used in this study.

Water Sample	W1P	W2B	TW	STW	CW
TDS / ppm	45 ± 1	349 ± 6	545 ± 7	232 ± 5	214 ± 1
Conductivity / µS	63 ± 0.5	490 ± 9	767 ± 9	326 ± 6	302 ± 1.4
Salt /ppm	36 ± 1.5	236 ± 3	373 ± 5	157 ± 3	146 ± 1

The values presented in Table S1 are the averages over the repeat tests with their accompanying standard error, determined according to Equation S1:

$$s_x = \frac{s}{\sqrt{n}} \tag{S1}$$

where s_x is the sample standard error, n is the number of repeat measurements, and s is the sample standard deviation, calculation according to Equation S2:

$$s = \sqrt{\frac{1}{n-1}\left[\left(\sum_{n=1}^{n} x_i^2\right) - n\bar{x}^2\right]} \tag{S2}$$

A comparison between the TDS, conductivity and salt content values for the two sources with the highest (TW) and lowest (W1P) contamination values can be seen in Figure S8.
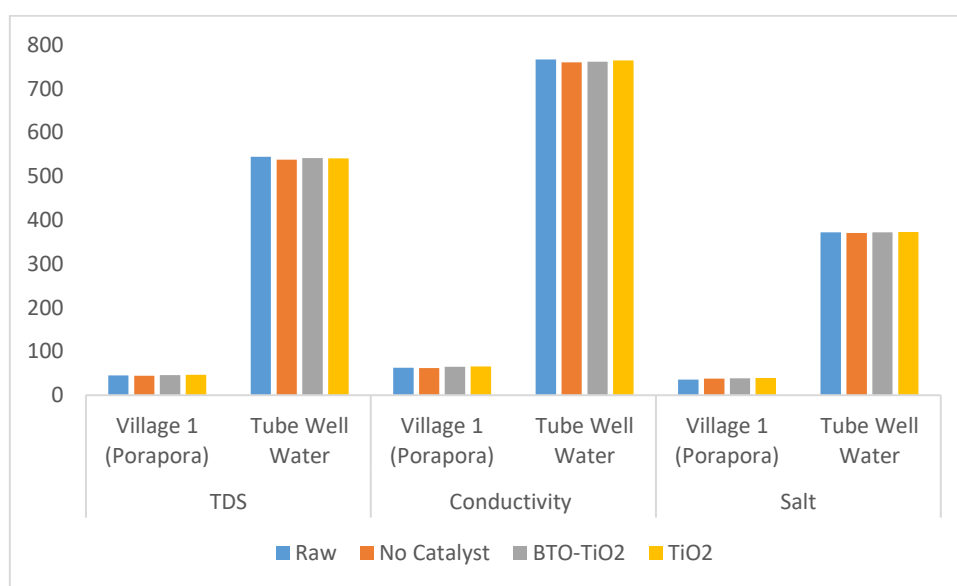

Figure S8 - Plot to indicate the difference between the highest and lowest solid contamination levels observed. The vertical axis units for TDS and salt are ppm, and µS/cm for conductivity.

Bacterial Content

All Counts after 3 hours of treatment

Table S2 - Bacteria Count Averages, Standard deviations (SD), standard errors (SE) and relative errors (rel. er.).

		W1P				W2B				CW				TW				STW			
		Average	SD	SE	rel. er.	Average	Sd	SE	rel. er.	Average	Sd	SE	rel. er.	Average	Sd	SE	rel. er.	Average	Sd	SE	rel. er.
CFU / mL	Raw	2150	566	400	0.19	4625	1583	913	0.20	483	177	102	0.21	2100	672	475	0.23	342	420	242.	0.71
	No Catalyst	500	214	123	0.25	381	128	64	0.17	283	339	196	0.69	200	35	25	0.13	513	336	238	0.46
	BTO-TiO$_2$	192	123	71	0.37	88	72	36	0.41	67	72	42	0.63	338	336	238	0.70	63	53	38	0.60
	TiO$_2$	488	407	288	0.59	213	145	73	0.34	83	123	71	0.85	288	336	238	0.83	438	407	288	0.66
dish	Raw	86	23	16	0.19	185	63	37	0.20	19	7	4	0.21	84	27	19	0.23	14	17	7	0.71
	No Catalyst	20	9	5	0.25	15	5	3	0.17	11	14	8	0.69	8	1	1	0.13	21	13	10	0.46
	BTO-TiO$_2$	8	5	3	0.37	4	3	1	0.41	3	3	2	0.63	14	13	10	0.70	3	2	2	0.60
	TiO$_2$	20	16	12	0.59	9	6	3	0.34	3	5	3	0.85	12	13	10	0.83	18	16	12	0.66

The above data (Table S2) was calculated for the raw counts in the Petri dish (40 µL of sample) and the scaled values converted to CFU/mL. The values were calculated according to the same formulae above (Equations S1 and S2). This data was used to produce Figure 4, with the associated error plotted using the standard errors. Relative error is calculated as the standard deviation divided by the average value.

Time interval testing – 1, 3 and 5 hours of treatment

Table S3 - Average bacteria counts for each treatment type on W2B for 1, 3 and 5 hours of treatment

| Time (hours)	Colony Counts (CFU/mL)		
	No Catalyst	BTO-TiO$_2$	TiO$_2$
0		4625 ± 914	
1	492 ± 79	175 ± 63	313 ± 88
3	381 ± 64	88 ± 36	213 ± 73
5	58 ± 36	33 ± 22	50 ± 25

Table S3 shows the data used to produce Figure 5, (shown here as "value ± standard error"), with error bars plotted from the relative error, determined by dividing the standard deviation by the average value obtained.

Table S4 - Normalized and linearized data from Table S3, used to plot Figure 6

Time (hours)	N/N$_0$				-LN(N/N$_0$)			
	0	1	3	5	0	1	3	5
No Catalyst	1	0.106306	0.082432	0.012613	0	2.241431	2.495776	4.373058
BTO-TiO$_2$	1	0.037838	0.018919	0.007207	0	3.274446	3.967593	4.932674
TiO$_2$	1	0.067568	0.045946	0.010811	0	2.694627	3.08029	4.527209

Mass Transport Limitation

The LED used in the mass transport limitation study had a peak wavelength of 370 nm, as shown in Figure S9, and was operated at a voltage of 5 V and a current of 0.8 A (4 W). The LED was purchased from Intelligent LED Solutions (ILS, UK).
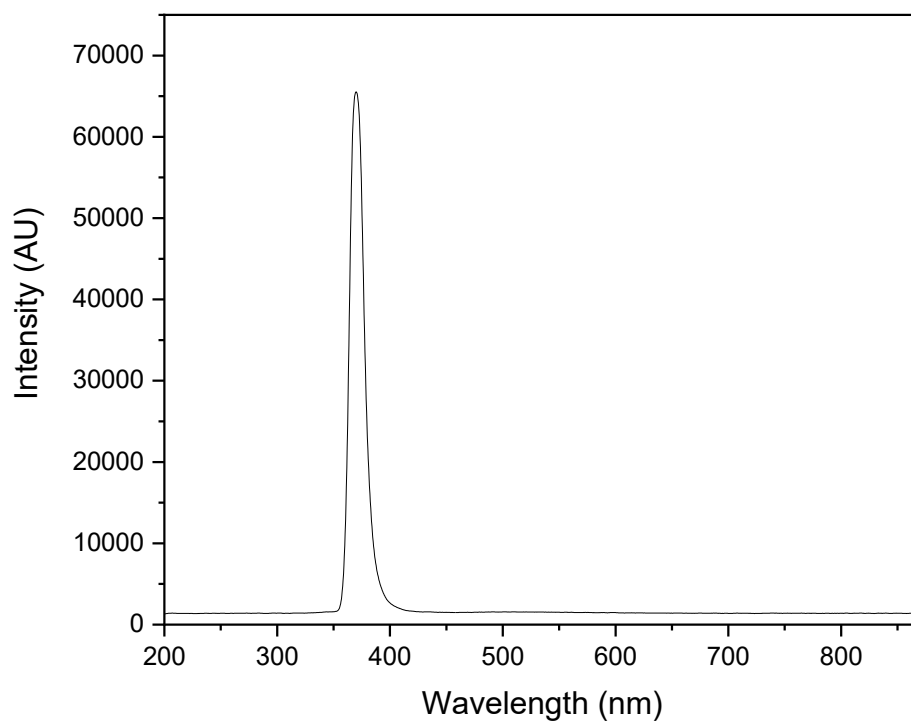
Figure S9 - Emission spectrum of the 370 nm LED employed in the study