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The Efficacy and Environmental Implications of Engineered TiO_2 Nanoparticles in a Commercial Floor Coating

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Table SI1. Standard conditions used for the Taber abrasion test on floor tiles, including the material of the abrasion wheels, the normal force, and the number of abrasive cycles (number of turntable revolutions).

Abrasion Wheel Type	**Wheel Composition**	**Relative Abrasive Action**	**Wheel Weight**	**Number of cycles**	**Number of runs (replicates)**
Wheel CS10	Rubber and aluminum oxide particles	Soft	1000 g	2500	5
Wheel H-18	Vitrified silica and aluminum oxide	Hard	500 g	100	5

Table SI2. Chemical composition of the commercial floor coating product determined by ICP-MS after HNO_3/HF microwave digestion.

Major Elements	Concentration in Original Product Sample A (mg/L)	wt.% in Original Product Sample A*	Concentration in Sample B Suspension (mg/L)
Potassium (K)	104,258 ± 3505	9.36	498.9 ± 28.1
Calcium (Ca)	31.1 ± 1.2	0.0028	175.7 ± 14.1
Sodium (Na)	285.4 ± 2.5	0.026	7.0 ± 1.8
Aluminum (Al)	41.8 ± 0.3	0.0038	10.9 ± 0.7
Iron (Fe)	35.5 ± 0.6	0.0032	21.1 ±1.4
Titanium (Ti)	18.2 ± 0.8	0.0016	144.0 ± 10.5
Silicon (Si)	49,412 ± 513	4.44	2634.8 ± 210.8
Nickel (Ni)	0.2 ± 0.06	<0.001	< 0.3
Phosphorous (P)	30.7 ± 0.8	0.0028	3.5 ± 0.4
TiO_2 solids	30.3 ± 1.3	0.003	242.4 ± 14.1

* The liquid coating product (sample A) has a density of ~1.11 kg/L.

Figure SI1. Fluorescent lamp irradiance spectrum from 300 to 800 nm for the antimicrobial efficacy test. UV light was found insignificant for this study.

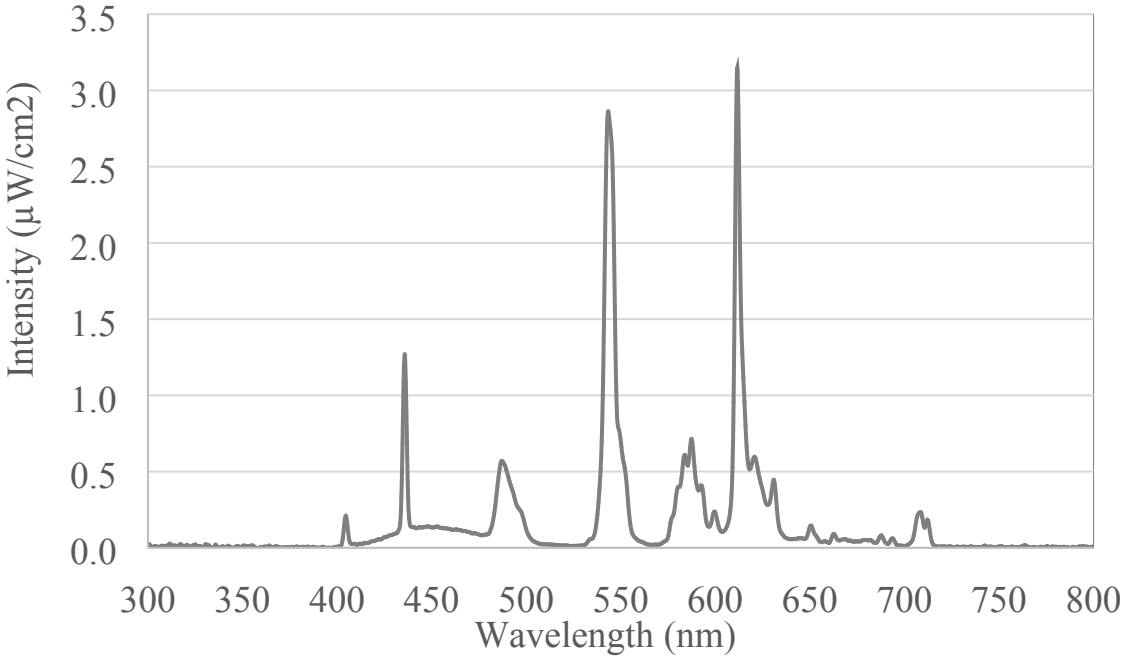


Figure SI2. Transmission electron microscopy (TEM) micrographs of particles separated from the coating product with corresponding EDX results. (a) aggregates of TiO_2 nanoparticles; (b) amorphous potassium silicate; (c) histogram of TiO_2 particle size distribution.

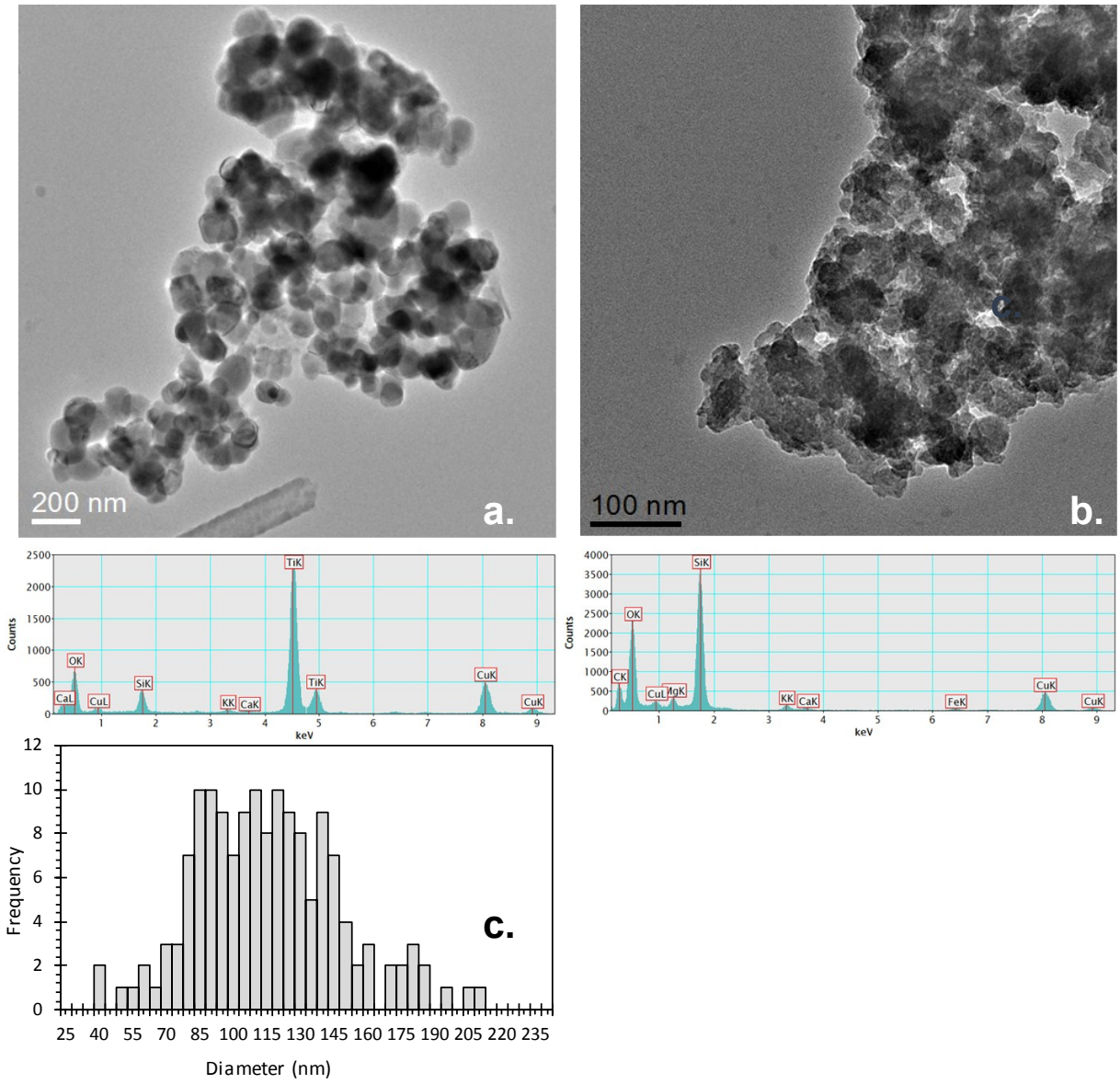


Figure SI3. Wide-scan XPS spectrum collected from extracted solids from the commercial floor coating product.

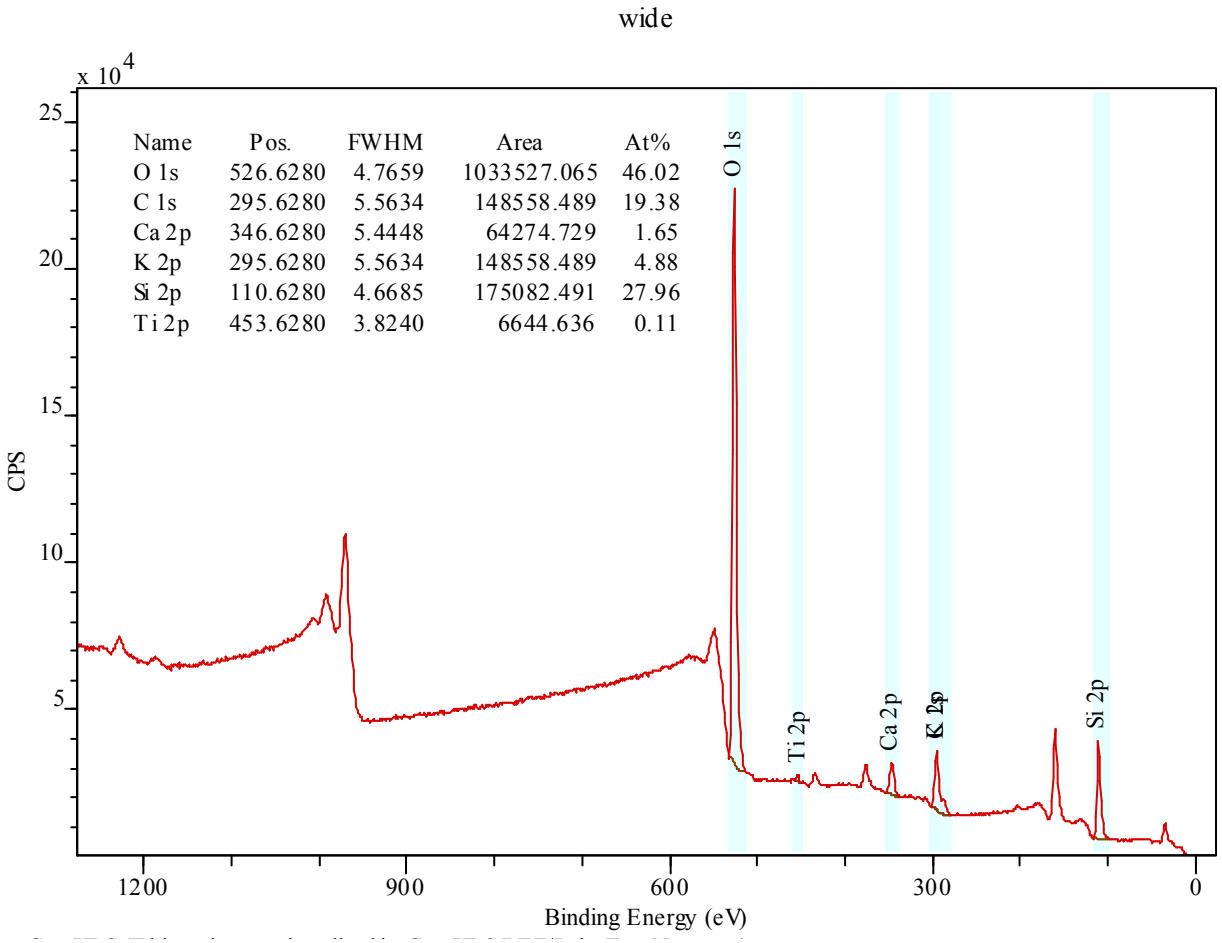
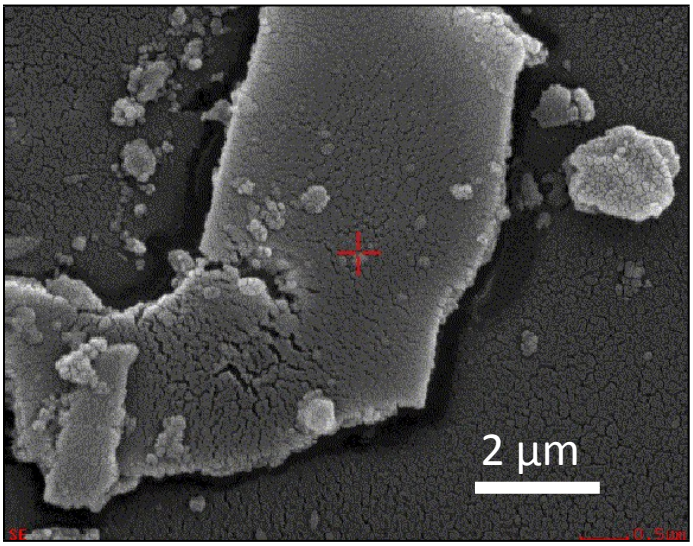


Figure SI4. Scanning electron micrograph (SEM) of surface coated tile with the commercial product containing TiO_2 nanoparticles. The corresponding EDX result shows the dominance of silicon and potassium on the tile surfaces.



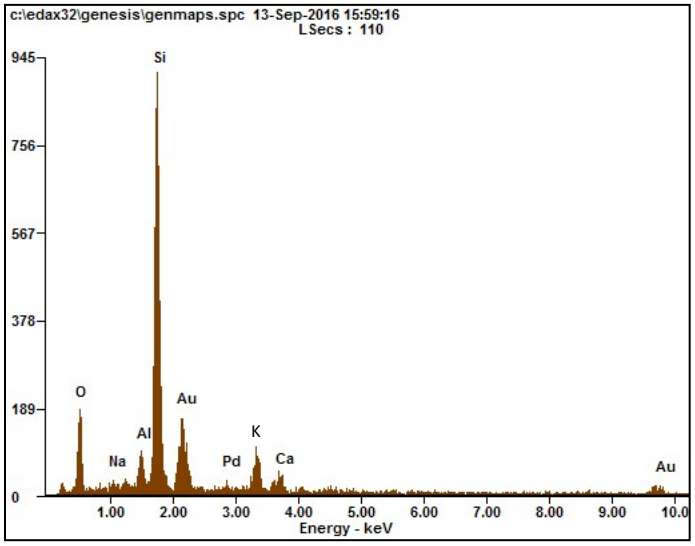
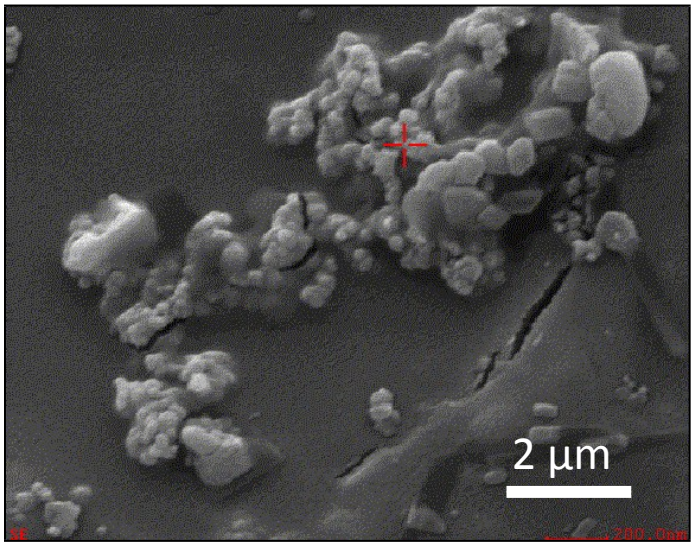


Figure SI5. SEM image of surface coated tile with the product containing additional food-grade TiO_2 nanoparticles for a surface coverage of ~10 mg/m^2. The corresponding EDX result shows clusters of TiO_2 nanoparticles on the tile surface after coating application.



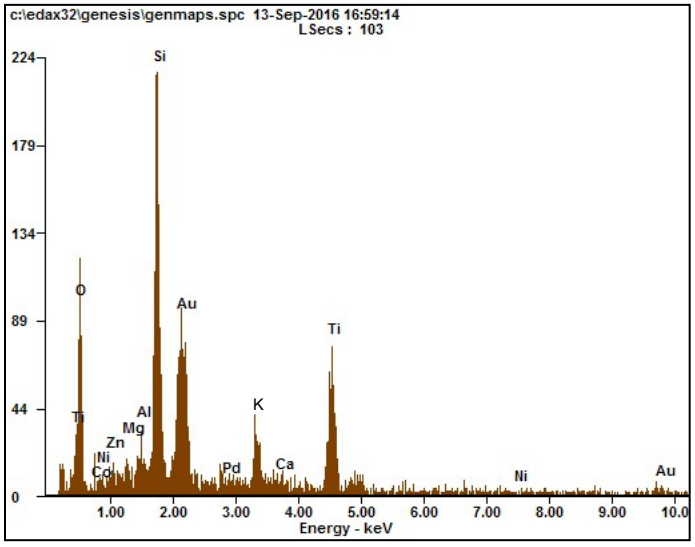


Figure SI6. Optical profiler data showing the topography of coated tile surfaces with the original product (sample A) after the abrasion test using H-18 (coarse) abrasive. Surface roughness significantly increased after the abrasion, resulting in ~5 µm loss of surface thickness. The left side of the white bar shows the unabraded surface, and the right side shows the abraded surface.

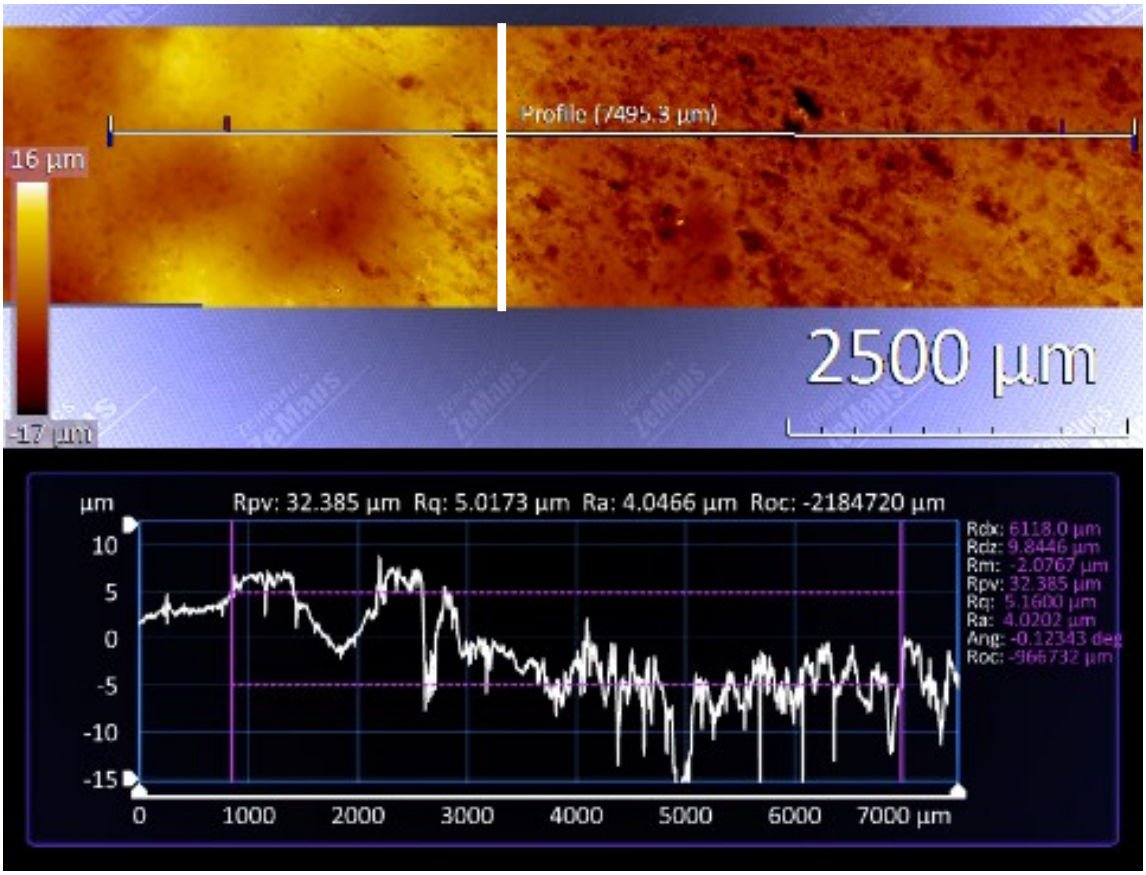


Figure SI7. Water contact angle of coated floor samples with varied TiO_2 content. The inserted images above the bars illustrate the relative difference in contact angle during the measurement.

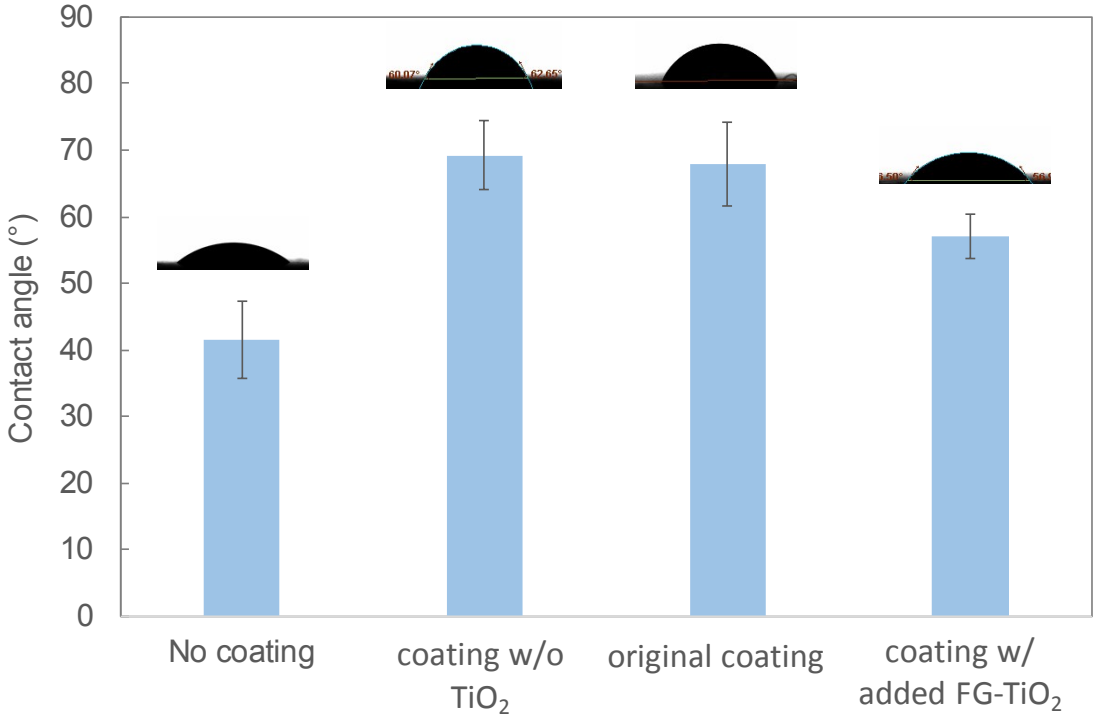


Figure SI8. Comparison of the first-order photocatalytic degradation of methyl orange (MO) in the presence of coating TiO_2, NIST SRM 1898, and food-grade TiO_2 under UV light irradiation at 312 nm. MO concentration was 10 mg/L, TiO_2 concentration was 60 mg/L, pH = 8.0.