**Supplementary Material**

**Monitoring of total volatile organic compound emissions from plastic runway surfaces**

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***Characterization of as-prepared TiO2 materials***

The applications and properties of nanomaterials mainly depend on their morphology and phase, and the size of individual particles depends on the specific preparation method (Zak et al. 2012; Womble et al. 2018; Yuan et al. 2019). Here, X-ray diffraction (XRD) analysis of TiO2 powder was carried out on an X-ray diffractometer, using Cu-Kα radiation (*λ* = 1.5406 Å) with a Cu X-ray tube operated at 40 kV and 40 mA. The interval of data points was 0.02°, and the scanning speed was 3° min-1. Jade software was used to measure the half maximum bandwidth (*β*) and diffraction angle (*θ*) of diffraction peaks. TiO2 particles were scattered in ethanol using ultrasonic treatment for 5 min. Then the suspensions were put on a copper mesh supported by carbon film for transmission electron microscopy (TEM), and the microstructure of TiO2 was observed under an accelerating voltage of 300 kV. Digital Micrograph software was used to measure the lattice spacings.

***Crystalline size and nanoparticle properties***

Granular TiO2 was prepared by controllable hydrothermal treatment of TiCl4/NH3·H2O/SDS mixtures. It was a three-dimensional nanocrystalline with partial aggregation (Figure S1*A*). The average grain size (*L*) of TiO2 was estimated at 15 nm (Figure S1*B*) when prepared with an initial pH of 6.0. The *L* was similar to that at 25.2° from Figure S2*B*, as calculated by the Scherrer formula (Eq. (6)), using *β* of the (101) diffraction peak (Huang et al. 1993; Drits, Środoń, and Eberl 1997). *K* is a constant related to crystalline shape. Because the particles were nonspherical, for the low-angle diffraction lines of nanogranular crystals (Monshi, Foroughi, and Monshi 2012; Muniz et al. 2016), Eq. (7) is used to calculate the *L*n:

(6)

(7)

In this synthesis,15.08 nm. The lattice spacings were 3.5 and 1.9 Å corresponding to the (101) and (200) planes (Figure S1*C*), which were defined as the crystal planes of anatase phase.

**Figure S1**.TEM (*A*) and HRTEM (*B*,*C*) images of anatase nanoparticles.

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Figure S2*A* and S2*B* show the energy dispersive X-ray (EDX) spectrum of micro-area elemental analysis and the XRD pattern of the as-prepared TiO2. The chemical compositions were Ti and O, where Cu and C peaks came from the copper mesh and support film, indicating that the products were undoped during calcination process. The crystal form of TiO2 was pure anatase according to the JCPDS card No. 89-4921 (Yang et al. 2013), and it became steady at 500 °C.

**Figure S2**.EDX spectrum (*A*) and XRD pattern (*B*) of anatase nanoparticles.



Na2HPO4-NaH2PO4 buffer solution was used to control the initial pH of the reaction system, which ranged from 5.7 to 8.0, and the pH values were accurately adjusted to 7.2, 6.8, 6.0 and 5.7. The initial pH was, before a hydrothermal reaction, the pH value of the solution measured with a pH meter. For weak alkaline and neutral media, the XRD patterns demonstrated a 30.8°peak of brookite (121) plane in the anatase phase (Figure S3). The 27.4°peak which indexed to rutile (110) plane appeared with decreasing pH from 6.0 to 5.7. The XRD signal at 30.8° disappeared, and the peaks of anatase at 53.9°, 55.1°, 68.8°and 70.3°wereassociated with the (105), (211), (116) and (220) planes, increasing with gradual pH change from 6.8 to 6.0. The 37.0°, 38.6° and 76.1°peaks appeared to correspond to the diffraction of the (103), (112) and (301) planes. Amorphous TiO2 is not photoactive, and anatase has a high photoactivity based on the generation of hydroxyl radicals (Mutuma et al. 2015; Fischer et al. 2017). In conclusion, it could be inferred that an initial pH of 6.0 facilitated improved photocatalytic performance.

**Figure S3**.XRD patterns of TiO2 powder for different initial pH values, hydrothermally prepared at 150 °C for 7 h and calcined at 500 °C for 2 h.



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