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Fluorine-free Bottom-up Strategy for the Synthesis of 2D TiO_2 Anatase

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Titanium oxide (TiO_2) is an inorganic compound that belongs to the wide group of *d*-metal oxides TMOs, which has been widely studied over the past few decades due to its low cost, chemical stability, non-toxicity, allowing its use in photocatalysis, electronics and biomedical applications [1], to give a few examples. TiO_2 exists in different polymorphs of which Anatase (tetragonal, $I4_1/amd$), Rutile (tetragonal, $P4_2/mnm$), Brookite (orthorhombic, *Pbca*) and TiO_2 (B) (monoclinic, $C2/m$) are the most commonly investigated structures. Among the four different crystalline phases of TiO_2, Anatase TiO_2 has been widely accepted to possess the most photoactive reactivity in catalytic applications [2]. 2D TiO_2 Anatase has been shown to have even better photocatalytic performance due to its dimensionality, which gives rise to higher surface to volume ratio [3]. One of the most used strategies for the synthesis of 2D TiO_2 Anatase is based on the use of a hydrothermal route, employing hydrofluoric acid (HF) as a capping agent [4]. Although the synthetic procedure is highly efficient, it involves the use of HF which is known to be highly corrosive and toxic. In this work we use a novel fluorine-free bottom-up strategy to synthesize 2D TiO_2 Anatase. The material has been fully characterized by X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), atomic force microscopy (AFM), transmission electron microscopy (TEM) and Raman spectroscopy. We show that the material has a two-dimensional morphology with high degree of crystallinity which is useful for photocatalysis applications.

References

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