A Novel Bottom-up Strategy for the Synthesis of 2D TiO_2 Anatase with Enhanced Catalytic Properties

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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 in several applications, ranging from photocatalysis, electronics and healthcare [1]. In particular, the Anatase phase of TiO_2 has been shown to possess the highest catalytic efficiency [2]. However, two-dimensional (2D) TiO_2 Anatase has been shown to have even better catalytic performance due to its higher surface to volume ratio, specific exposed facets and a large fraction of unsaturated surface atoms, compared to bulk TiO_2 [3]. However, the synthesis of 2D TiO_2 is still very challenging because the bulk crystal is not layered, hence it cannot be directly exfoliated into 2D TiO_2 nanosheets by liquid-phase exfoliation [4].

One of the most used strategies for the synthesis of 2D TiO_2 Anatase is based on hydrothermal route, employing a structure-directing agent such as hydrofluoric acid (HF) [5]. In this work we use a novel fluorine-free bottom-up strategy to synthesize high quality 2D TiO_2 Anatase with average lateral size of ~100 nm and thickness of 3-4 nm. The as prepared material has been tested for oxygen evolution reaction (OER) as compared to the commercial TiO_2 P25 nanoparticles and other materials reported in literature, showing enhanced OER properties with onset-overpotential and Tafel slope of 1.58 V and 75 mV dec^{-1} respectively in alkaline conditions (1M KOH) [6].

References

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