Anatase TiO_2 Nanosheets 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. This material 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 activity [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 TiO_2 nanosheets cannot be directly produced by liquid-phase exfoliation.

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) [4]. In this work we used a fluorine-free strategy to synthesize TiO_2 anatase nanosheets with average lateral size of 30-40 nm and thickness of 3-4 nm, and with exposed high energy facets, namely the (001), (100) and (010), as shown by Transmission Electron Microscopy. The as-prepared material has been tested for oxygen evolution reaction (OER) and 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) [5].

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