Method of Rapid Assessment of TiO_2 Construction Materials Photocatalytic Activity

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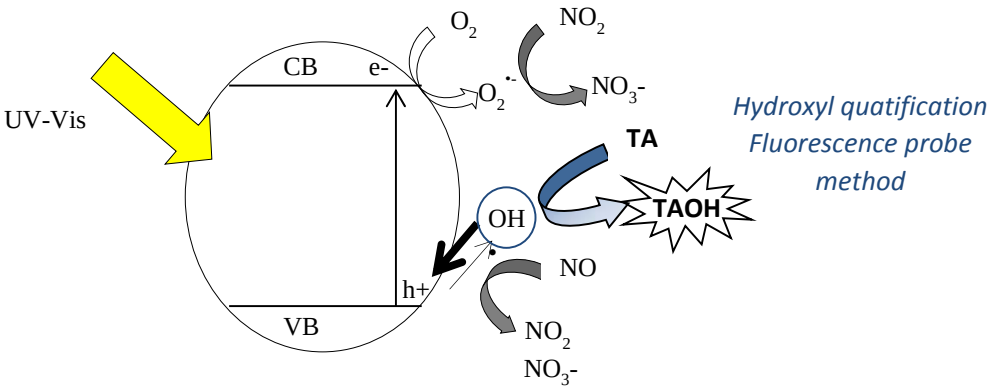
Graphical Abstract



Abstract

Although photocatalytic construction materials show good prospects, an ideal method to assess the photocatalytic activity is still not available and some crucial drawbacks must be solved: (i) The currently used methods are related to the ability to remove specific contaminants (mainly NOx and Rhodamine B); (ii) differ in many experimental parameters which makes it hard to compare experimental results;(iii) require expensive equipment and are very time consuming. In this context, this research deals with the **developed of new procedures for assessing the photocatalytic activity of TiO_2 construction materials based on the detection of active species formed during the photo-activation process**, and to contribute, as far as possible, to solve the drawbacks of current standards. Specifically, the Terephthalic Acid (TA) Fluorescence (FL) probe method allows quantifying the photocatalytic OH• formed in the bulk solution. The application of the TA-FL probe method on photocatalytic construction samples has allowed to obtain a new concept of photocatalytic activity measurements, the "OH• production rate", which allows the comparison between the samples independently of a specific contaminant. A good relationship of photocatalytic efficiency results between the developed method with NOx degradation tests was observed, which is of particular importance to extrapolate directly the photocatalytic results of TA-FL probe method to NOx degradation tests, which this are generally considered as the standard reference tests for determination of photocatalytic activity on photocatalytic construction materials. In addition, the potential to "simple-to-use", the short timescale involved, and inexpensive measurements give the developed test significant advantages over conventional photoactivity tests.