Study on Double Layer Properties of Nanoporous TiO_2 Films Using Quartz Crystal Microbalance

K. Noworyta, J. Augustynski
Département de Chimie Minérale,
Analytique et Appliquée
Université de Genève
30, quai Ernest-Ansermet
CH-1211 Genève 4
Tel.: +41 22 702 6029
Fax: +41 22 702 6830
E-mail: Krzysztof.Noworyta@chiam.unige.ch

The studies of the composition and properties of double layer on metal oxides are interesting from both a fundamental and a practical point of view. In this regard, the study of the behaviour of semiconducting metal oxides, such as TiO_2, is of great importance in view of their numerous applications in the field of photocatalysis and photoelectrochemical energy conversion. Better understanding of basic properties of this oxide can help the optimum choice of the reaction conditions.

Behaviour and properties of double layer formed on metal oxides are difficult to follow experimentally due to the complexity of surface reactions and difficulties in the interpretation of results. Quartz crystal microbalance (QCM) technique can be a useful tool for studying such processes thanks to possibility of following *in situ* very small mass changes. This technique was successfully used in research of double layer properties of metal electrodes(1-4) and adsorption processes taking place on metals as well as metal oxides.(5-7)

In this presentation we report microgravimetrical measurements of double layer properties formed on nanoporous TiO_2 films. QCM was employed to follow changes in double layer behaviour depending on pH, ionic strength and presence of different ions in the solutions. Frequency changes corresponding to changes in mass are discussed in terms of ion adsorption and in connection with water expulsion and water structure changes on the surface of the oxide.

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