

PHOTOELECTROCHEMICAL AND OPTICAL PROPERTIES OF NITROGEN DOPED TITANIUM DIOXIDE FILMS PREPARED BY REACTIVE DC MAGNETRON SPUTTERING

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Titanium dioxide, TiO₂, is a well-studied and used material for various photochemical applications. The semiconductor material combines good photoelectrochemical properties with high catalytic activity and good stability in most solvents over a wide pH range. However, the bandgap of the material, ~ 3.0 eV, only allows absorption of the UV light in the solar irradiation. Since the UV part of the solar spectrum only accounts for 4 % of the incoming solar energy, considerable efforts have been invested to broaden the photoresponse of the material. The normal approach has been to attach various kinds of organic dyes to the surface. This technique has been successful for solar cell applications when combined with nanoporous TiO₂¹. So far the most efficient dyes are expensive and the long-term stability may prove a problem. Another obstacle with the organic dyes is that they may detach from the surface when used in aqueous solutions, which prohibits the use of this approach for water oxidation and another photocatalytic applications in aqueous media.

Recently, Asahi *et al.*² introduced a new approach to broaden the photoresponse of TiO₂ by doping with nitrogen. In the present presentation we have taken Asahi's concept further. Nitrogen has been introduced in TiO₂ by means of reactive sputtering. The optical spectra, X-ray analysis and SEM pictures (Figure 1) of the nitrogen doped electrode material and the undoped TiO₂ will be reported³. The photoelectrochemical responses have been investigated in non aqueous solutions as well as in aqueous solutions for water splitting⁴.

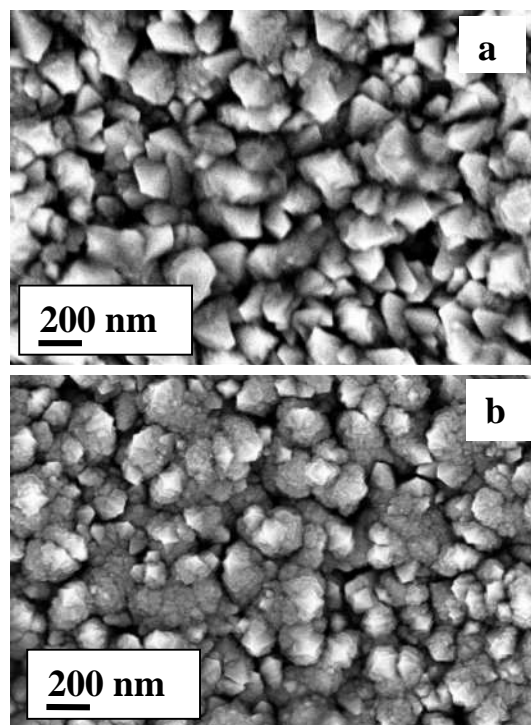


Figure 1. Scanning electron micrographs of (a) titanium dioxide and (b) nitrogen doped titanium dioxide.

1. B. O'Regan, M. Grätzel, *Nature* 1991, **353**, 737.
2. R. Asahi, T. Morikawa, T. Ohwaki, K. Aoki, Y. Taga, *Science* 2001, **293**, 269.
3. T. Lindgren, J. M. Mwabora, E. D. Avendaño Soto, J. Jonsson, A. Hoel, C.-G. Granqvist, S.-E. Lindquist, *submitted*.
4. G. Romualdo Torres, T. Lindgren, S.-E. Lindquist, *manuscript in preparation*.