

Self Organized Porous TiO₂

P. Schmuki, Jan Macak, Jan Macak²

*University of Erlangen-Nuremberg, Department of
Materials Science,
Chair for Surface Science and Corrosion (LKO)
Martensstrasse 7, D-91058 Erlangen, Germany*

² *Institute of Chemical Technology Prague,
Dept. of Power Engineering, CZ-16628 Prague, Czech
republic*

The etching of titanium and the formation of porous TiO₂ on titanium is investigated in electrolytes containing low concentrations of HF. It is found that under optimized electrolyte conditions and extended polarization, highly ordered porous TiO₂ is obtained that consists of pore arrays with single pore diameters of 140 nm and a pore spacing of 150 nm (such as shown in Fig. 1). Electrochemical, SEM and XPS investigations show that the porous layer forms under a competition of TiO₂ formation and oxide dissolution up to a limiting thickness. Typically, the time scale for complete self-ordering for the investigated systems is in the order of several hours. Several factors affecting the formation and morphology of the attack and the degree of self ordering will be discussed.

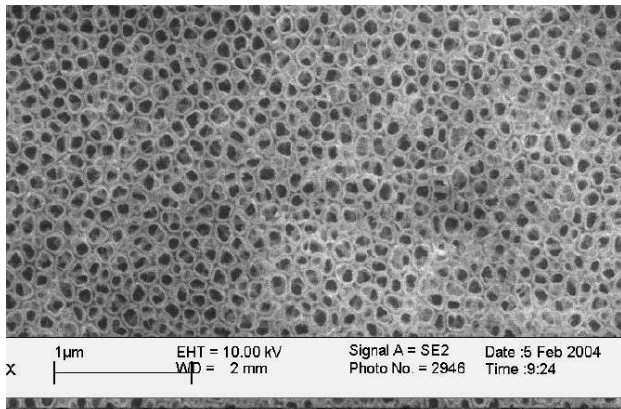


Figure 1: SEM image of titanium anodized at 20 V in H₂SO₄ (1 M) + HF (0.15 wt%) for 24 hours.