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## Ideally ordered nanohole array obtained by anodizing pre-textured metals

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Anodic porous TiO<sub>2</sub> has attracted attention due to its wide range of applications such as photonic crystals, solar cells and so on. Performances of the devices depend on its geometrical structures of a nanohole array. Therefore, for improvement of the performances, control of its geometrical structures is important. Until now, improvement of an arrangement of nanoholes in an anodic porous TiO<sub>2</sub> by self-ordering anodization process has been achieved. However, it is still difficult to obtain defect-free nanohole array structures in entire sample area. In this presentation, fabrication processes of an anodic porous TiO<sub>2</sub> having ideally ordered nanoholes will be presented. An ideally ordered anodic porous TiO<sub>2</sub> was obtained by anodizing a pre-textured Ti plate. Through a texturing process, an ordered array of concaves was formed on a surface of Ti. In a subsequent anodization, each shallow concave acts as a starting point for generation of a nanohole at initial stage of the anodization and results in an ideally ordered structure. We demonstrated two pre-texturing processes. One is a process to directly texture a surface of Ti. The nano pattern was formed by pressing a metal (Ni) mold onto a surface of Ti. The other is a process to texture a surface of Al layered on a Ti. A two-layered sample composed of an Al top layer and a Ti underlying layer was prepared. An ideally ordered array of concaves was formed on the surface of Al by pre-texturing process using a Ni mold. Owing to softness of Al, the nano pattern was easily formed. By anodizing the sample, the arrangement of nanoholes was transferred to the surface of Ti substrate, resulting in the ideally ordered anodic porous TiO<sub>2</sub>. These processes are expected to be applied to fabricate various functional devices, which require ideally ordered nanohole structures in TiO<sub>2</sub>, such as photonic crystals.

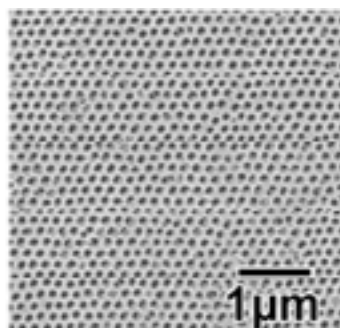


Figure 1 Ideally ordered anodic porous TiO<sub>2</sub>

### Biography

Toshiaki Kondo works in the field of nano/micro fabrication processing based on electrochemical methods such as anodic oxidation, etching, electroplating, etc. He has proposed several unique fabrication processes of two- and three-dimensionally ordered fine structures and its application to various functional optical devices such as photonic crystals and plasmonic devices. These fabrication processes provide an easy way to obtain various functional devices without applying an electron beam lithography technique.

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