Fabrication of Nano/Micro Structure on Metal and Semiconductor by Anodization

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Keywords: Anodization, Porous-type oxide film, Al, Ti, Sn, Zn, Nb, Mg, Fe, Semiconductor

Outline

~Old materials with new applications~

We are studying on inorganic surface chemistry and material science, including electrochemistry, surface treatment as well as micro- and nanostructuring. Preparation, characterization and functionalization of nano-objects are important research subject to improve the fundamental understanding of various processes and the resulting materials. The fabrication technique and various materials developed in our laboratory have potential technological and scientific applications in various research fields.

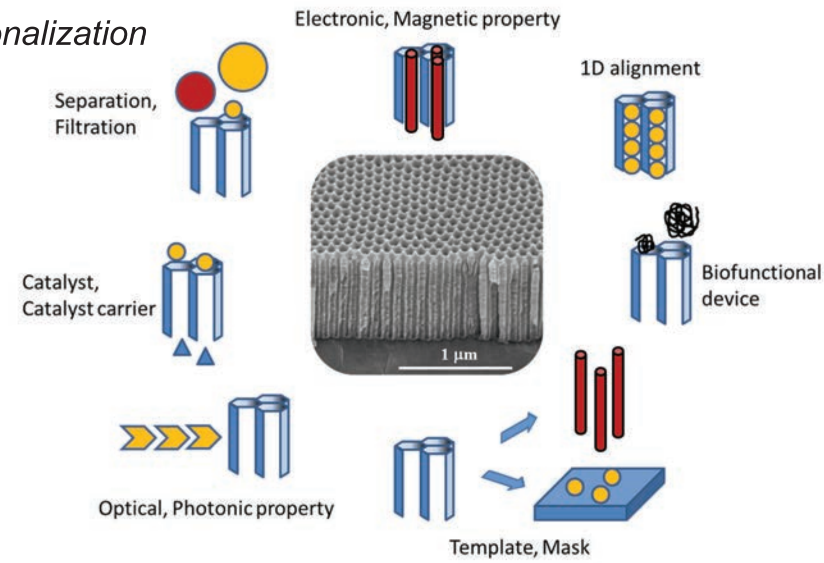
What is Anodization ?

Anodization is an electrochemical process that converts the metal surface into a decorative, durable, corrosion-resistant, anodic oxide finish. Anodizing of aluminum is well-known and widely used, although other nonferrous metals such as magnesium and titanium also can be anodized.

Anodization of valve metals and functionalization of anodic oxide films

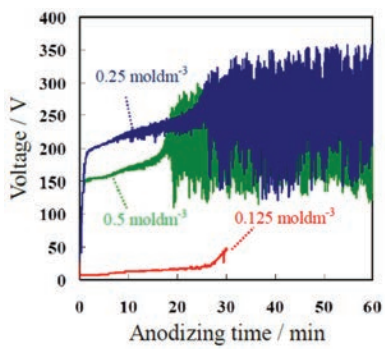
Barrier-type anodic oxide film
- Electrolytic capacitor
- Improvement of dielectric properties

Porous-type anodic oxide film
(Al, Ti, Nb, Ta, Sn, Zn, Stainless steel…)
- Protection, decoration of metal surface
- Template, catalyst support, photocatalyst, chemical sensor



Corrosion protection of magnesium

Surface modification, Plasma electrolytic oxidation
- Improvement of corrosion resistance of Mg



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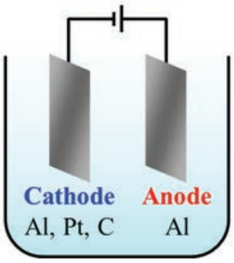
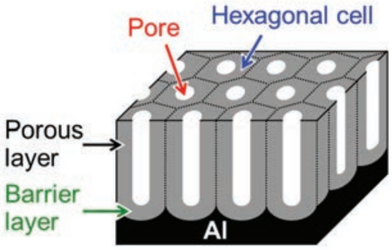
Characteristics of anodic porous alumina

1) Controllability of dimensions of porous structure
2) Regularity of pore arrangement

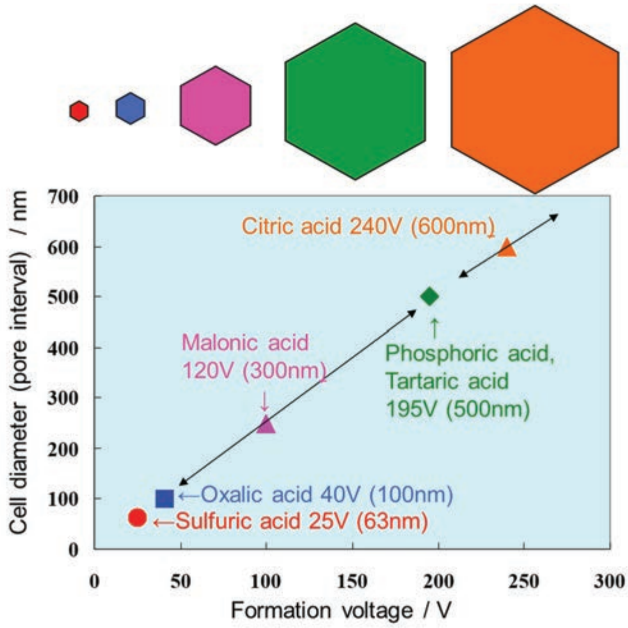




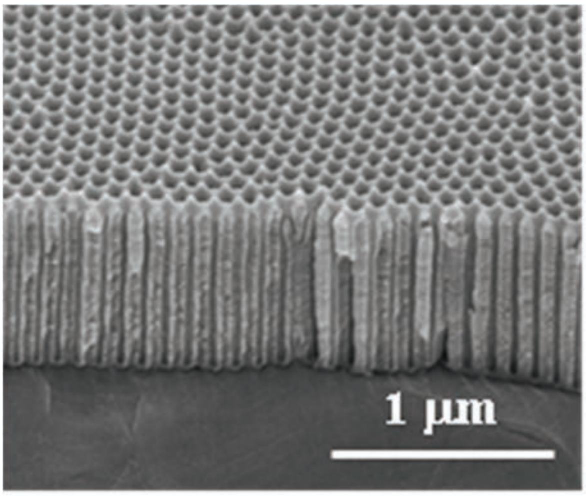
Cell dimension is proportional to formation voltage

Cell diameter [nm] ≈ 2.5 [nm / V] × formation voltage [V]

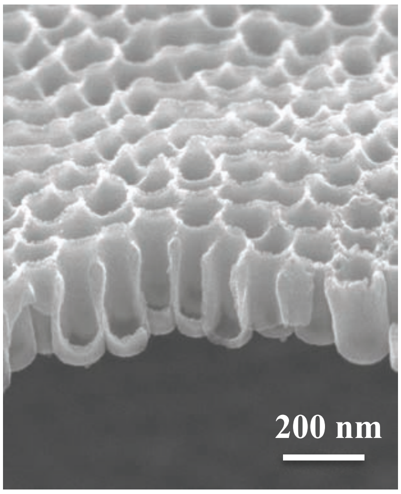
Pore diameter [nm] ≈ 1.0 [nm / V] × formation voltage [V]



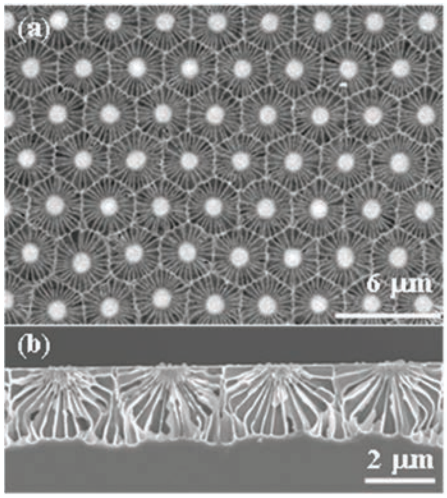
Application



Porous Al_2O_3

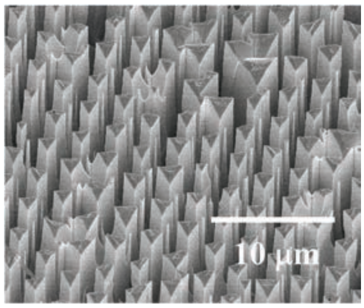


Porous TiO_2



Porous InP

Related information



GaAs pillar

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