

9th International Workshop on Electrodeposited Nanostructures

Templated electrodeposition of nanocubes

A. Wouter Maijenburg¹, Azusa N. Hattori², Hidekazu Tanaka³, and Johan E. ten Elshof⁴

¹MESA+ Institute for Nanotechnology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands, e-mail: a.w.maijenburg@utwente.nl

²Institute of Scientific and Industrial Research, Osaka University, 8-1 Mihogaoka, Ibaraki, Osaka, 567-0047, Japan, e-mail: a-hattori@sanken.osaka-u.ac.jp

³Institute of Scientific and Industrial Research, Osaka University, 8-1 Mihogaoka, Ibaraki, Osaka, 567-0047, Japan, e-mail: h-tanaka@sanken.osaka-u.ac.jp

⁴MESA+ Institute for Nanotechnology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands, e-mail: j.e.tenelshof@utwente.nl

Templated electrodeposition is an appropriate technique for the synthesis of nanomaterials in any desired shape and composition. Using electrodeposition, a wide range of materials can be synthesized in a simple and cost-effective manner, and using a template to guide the electrodeposition provides a method for perfect pattern replication. Until now, the most common nanostructures that are made by templated electrodeposition are nanowires and nanotubes in the circular or hexagonal pores of track-etched polycarbonate or anodized alumina membranes.

However, the choice for nanocubes would be more straightforward for the use as a building block. Since there is no reproducible technique available yet for the synthesis of monodispersed nanocubes of arbitrary composition, templated electrodeposition in a cubic template would be convenient for nanocube formation.

We have created cubic templates on an Au-coated Si wafer by nanoimprint lithography from a cubic master with 200 nm edges. The Au layer serves as the working electrode in a three-electrode setup for Ni electrodeposition inside the cubic pores. Since the area available for electrodeposition will increase once the top of the template is reached, the height of the nanocubes can be tuned in order to obtain cubic structures with equal lengths on all edges.