

Optimisation of Nanopillar Structure Fabrication using Templatation on Porous Anodic Alumina

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Abstract:

Nanopillar structured electrodes offer unique advantages in precise and real-time acquisition of such feeble electrical signal, enabling high contact surface area. However, fabrication of nanopillar structures remains a challenging task requiring complex fabrication approaches that are both cost and resource intensive. Nanotemplation is an easy and fast approach to fabricate high-aspect ratio nanopillar structure. However, often requires destruction of the template often requires attain high-aspect ratio pillars. This work explores the fabrication of nanopillar electrodes using uniformly ordered porous anodic alumina (PAA) templates, taking advantage of the varying thermal properties of the polymer and PAA template. Nanopillar-electrodes architected polydimethylsiloxane PDMS films featuring straightforward and cost-effective, together with superior output performance. The formation of nanopillars was conducted on four PAA templates under the following conditions: two-steps anodisation of 5 min and 1 min respectively at a voltage of 70V. Pore widening procedure was performed at different intervals 0, 5, 10, and 20 min. Following the pore widening process, all templates were coated with PDMS mixture containing 40 wt% toluene and 60 wt% PDMS. One sample was maintained at room temperature, while the others were stored in refrigerators at temperatures of 4°C, -20°C, and -40°C. After the PDMS coating had solidified, the PDMS was carefully peeled off from the PAA templates. These templates were found to be reusable after the coating removal process. The architectures of synthesised nanopillars were analysed using FIB-SEM imaging measurements.