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Protocol

Fabrication of nanostructured metallic films

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To cite this version

Ana Arché-Núñez, Beatriz L. Rodilla, Sandra Ruiz-Gómez, Lucas Pérez, M. Teresa González. Protocol – Fabrication of nanostructured metallic films. 2026.

https://hdl.handle.net/20.500.12614/4297

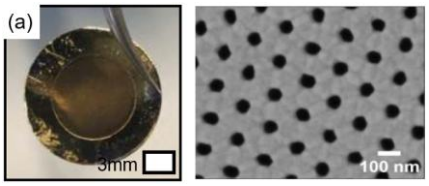
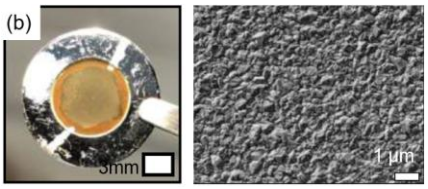
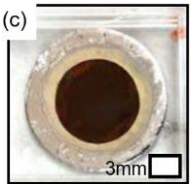
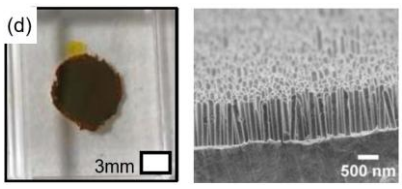
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Fabrication of flexible metallic films with nanostructured surface

Starting from a nanoporous alumina template, we obtain a flexible metallic film with one surface nanostructured with a network of vertical metallic nanowires

1. Metallization of the ordered side of the nanoporous alumina template by sputtering: - Final gold thickness: 150 nm. - Deposition parameters: • Current: 30 mA • Stage working distance: 45 mm • Stage tilt: 0 • Rotation: 5 (speed/action) - Vacuum conditions: • Sputter vacuum: 1×10^{-2} mbar • Base vacuum: 6×10^{-5} mbar	
2. Base thickening by pulse-plating electrodeposition of gold: - Setup: Electrolytic cell. WE at the bottom, where the sample is placed leaving only the metallized side exposed - Commercial Au electrolyte - Room temperature - First step: 16,000 pulses • ON: V=-1.5 V, t=0.001 s • Rest: V=0, t=0.01 s - Second step: 7,500 pulses • ON: V=-1.5 V, t=0.01 s • Rest: V=0, t=0.1 s	
3. Gold nanowire growth by DC electrodeposition: - Setup: Teflon electrochemical cell. WE at the bottom, where the sample is placed with the metallized side looking down - Commercial Au electrolyte - Room temperature - V=-1.5 V, time depending on the desired length of the nanowires	
4. Extra base thickening, repeating step 2 with: - 8,000 pulses for the first step - 20,000 pulses for the second step	
5. Release of free standing nanowires: - Setup: Electrolytic cell with O-ring - Wet etching: aqueous solution 0.2 M of CrO_3 and 0.7 M H_3PO_4 - Temperature: 45°C - Finish washing in acetone, ethanol, and deionized water.	

Materials:

- Gold sputtering target
- Commercial Au electrolyte (OROSENE® ORE+4, Italgalvano)
- Electrolytic Teflon/PEEK cells
- Chemicals: acetone, ethanol, CrO_3, H_3PO_4

Techniques:

- Sputtering
- Electrodeposition