Plasmonic nanowire arrays as a platform for photocatalytic testing

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We report the fabrication of two dimensional metallic nanowire arrays over mm-sized areas on an electrode using templated electrodeposition and subsequent post-processing (see Fig. 1 a). This approach allows control of the metal (Au, Ag, or a combination of both), the nanowire length, aspect ratio and inter-wire separation in the array can be controlled. These are characterized in terms of their structure by SEM (see Fig. 1 b) and cross-sectional TEM [1]. The plasmonic response was investigated using finite element modeling and monochromated electron energy low loss spectroscopy. Of special interest are the different coupled modes, the effect of the substrate (Figs. 1c,d) and modes detected at very low energy. Subsequent atomic layer deposition of a thin layer of semiconductor photocatalyst onto the array permits photocatalytic testing under controlled conditions [2] in order to identify any effects of plasmonic enhancement.

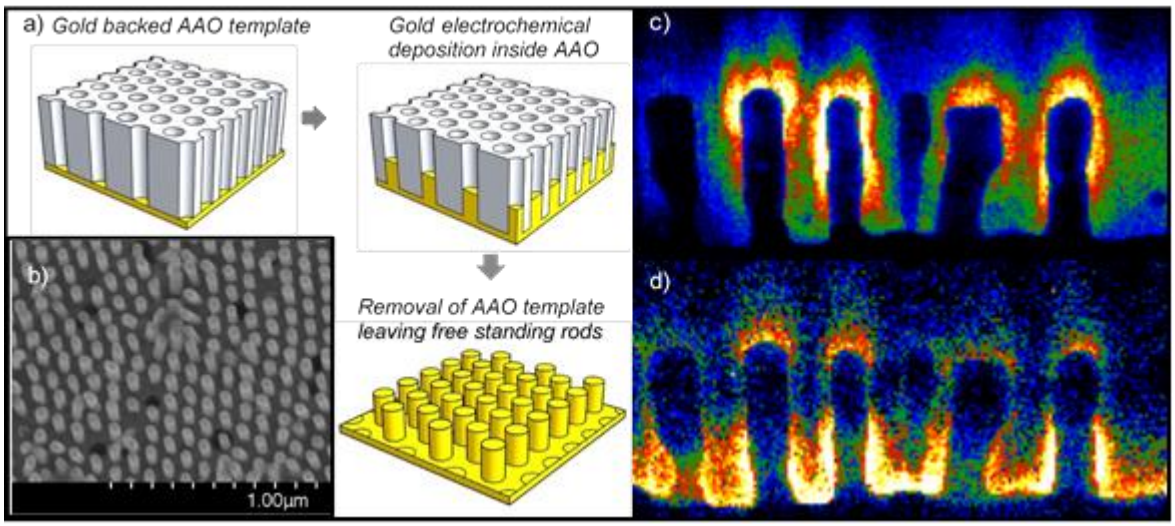

FIG. 1. a) Schematic diagram showing fabrication of a regular Au nanowire array supported on an Au substrate, b) Tilted SEM image of fabricated Au nanowire array, c-d) EELS plasmon maps between 0.7-0.8eV and 1.9-1.95eV, respectively (ZLP FWHM is 35meV) showing two different coupled modes of the array. EELS data acquired using a Nion UltraSTEM 100MC Hermes microscope at SuperSTEM.

References

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