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Fabrication of and application of anodic alumina film with custom-designed nanochannel arrays NAI-WEI LIU, Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwa, Republic of China, ANINDYA DATTA, CHIH-YI LIU, CHENG-YI PENG, HUAI-HSIEN WANG, SHR-BIN WU, TSU-SHIN CHAN, CHEN-FENG HSU, JUEN-KAI WANG, YUH-LIN WANG, National Taiwan University, Taipei, Taiwan, Republic of China — Among the strategies for growing one-dimensional straight nanostructure such as nanorods and nanowires, a viable approach is to grow the materials into templates with aligned nanochannels. Recently, porous anodic aluminum oxide (AAO) film has become an attractive template material for its self-aligned array of nanochannels. In this work, we have demonstrated, for the first time, a focused ion beam (FIB) direct-write lithographic method for selectively closing part of the channels of an ordered array on an AAO film creates a custom-designed nanochannels array. The initial ordered arrays are fabricated by FIB lithographic guiding techniques while the closure of the nanochannels within certain area is achieved by FIB bombardment of the AAO film. Besides, arrays of Ag-nanoparticles grown on anodic alumina nanochannels with precisely tunable gaps (5-25 nm) are exploited for surface-enhanced Raman spectroscopy. The enhancement becomes significant for gaps below 10 nm and turns dramatic when gaps reach an unprecedented value of 5 nm. The results are quantitatively consistent with theories based on collectively coupled surface plasmon.

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