

## Free-standing nanostructured gold films with milled nanopores for DNA analysis

J A Grant-Jacob<sup>1\*</sup>, F Carpignano<sup>1,2</sup>, W S Brocklesby<sup>1</sup> and T Melvin<sup>1</sup>

<sup>1</sup>Optoelectronics Research Centre, University of Southampton, UK

<sup>2</sup>Dipartimento di Ingegneria Industriale e dell'Informazione, University of Pavia, Italy

\*E-mail: jagj1v11@soton.ac.uk

Nanoporous thin films are of much interest for emerging DNA sequencing applications [1]. Klarite® pyramidal nanostructured substrates and gold microcavities have demonstrated strong field enhancement within their structure [2,3]. Our strategy has been to develop these three-dimensional structures in gold film form. As displayed in figure 1, free-standing thin films (100 nm thick) of arrays of nano-sized gold pyramids and microcavities have been successfully fabricated. Precisely engineered nanopores in the three-dimensional nanostructured free-standing gold film are milled at specific locations using a helium ion microscope (HIM). These films are suspended over micron-sized apertures for optical interrogation within platforms already proven for DNA translocation and sequencing. The strong field enhancement at the base of structures is currently being investigated for enhancement of fluorescently labelled DNA strands passing through the nanopores.

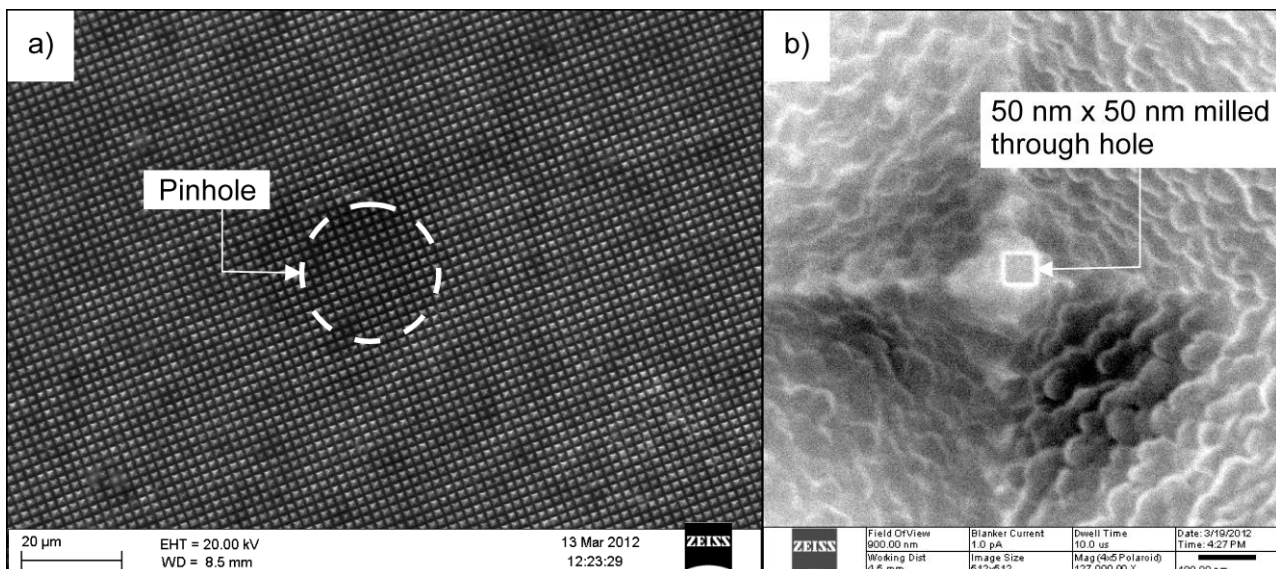


Figure 1: SEM image of gold pyramids over a 20 µm pinhole. b) HIM image of a single pyramid after milling a 50 nm square aperture.

- [1] Branton D, *et al.* 2008 The potential and challenges of nanopore sequencing *Nat. Biotechnol.* **26** 1146-53.
- [2] Perney N M B, *et al.* 2006 Tuning localized plasmons in nanostructured substrates for surface-enhanced Raman scattering *Opt. Exp.* **14** 847-57.
- [3] Coyle S, *et al.* 2001 Confined Plasmons in Metallic Nanocavities. *Phys. Rev. Lett.* **87** 15–8.

We acknowledge the BBSRC (Ref: BB/I023720/1) and the CARIPLO Foundation, Italy for funding JAG-J and FC respectively and Renishaw Diagnostics, Glasgow for providing us with some of the samples used in fabricating these structures.