

*NanoScope now offers Cryo-DualBeam capabilities, new techniques for modifying IC's with copper, and new repackaging options.*

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Are your details correct? - email us your corrections at [correctme@NanoScopeServices.com](mailto:correctme@NanoScopeServices.com) and as a thank-you, the next time you use our services we will pay the return shipping costs.

Sehr geehrter/Dear <Contact>

### New techniques for working with copper metallisation.

Copper introduces several new problems for the FIB modification of IC's, however it also provides some practical assistance.

The power distribution layers at the top of a copper IC process are generally densely packed and relatively thick, making initial FIB access difficult. Neighbouring copper metal grains have significantly different milling rates and each copper layer is coated by implanting isolation which mimics metal layer end-point-detection. These factors make the results from standard FIB processes and their established control mechanisms less predictable. At the same time, decreasing signal line pitch for the 90, 65 and 45 nm nodes, adds new depth and accuracy requirements to difficult circuit interventions. NanoScope has developed several techniques for dealing with copper and we routinely modify copper devices within certain constraints.

Step 1) - Cutting windows through passivation and power structures (using an 'equal grain rate' milling strategy).

Step 2) - Identifying the X and Y limits of the access window to the lower layers by exposing the edges of buried structures, and then re-sealing exposed edges with Insulator deposition.

Step 3) - Finally using the pattern 'infill' (another unwelcome addition with copper) as a navigational tool to exactly target the nodes in the lower layers. This additional accuracy is not available by using conventional CAD Navigation referenced to top metal layers.

NanoScope is already developing new techniques for dealing with copper and even the next level of complexity that advanced materials will bring.

### New Technique Introduction-Package re-sealing (glob-topping)

Ever wanted to re-package a device after it has been de-capsulated and then FIB modified? NanoScope now offers a fast and safe **glob-topping** service for re-sealing the tops of opened and modified packaged devices for subsequent testing purposes.

The process can be done in a day and works with all bond wire types (not BGA - sorry). This technique compliments our normal package handling services which currently include :

### Focus on - Copper Deposition for long or low resistance connections.

Our technique for adding ultra low resistance connections ( $1.7\mu\Omega/\text{cm}$ ) as part of a device fix - offers new possibilities for working with mixed signal designs, or adding fixes over large distances.

**Laser induced copper deposition** can be specified as part of a device fix when resistance is an issue - the connecting vias must be of FIB deposited Tungsten for filling uniformity reasons.

Copper depositions can also carry higher currents-so are ideal for re-routing power. The process is very fast, so after initial set-up long or multiple tracks can be added in a short time and are not more costly than smaller fixes. For high density fixes, copper can be used in conjunction with finer Tungsten tracks - as Tungsten still has  $1/3^{\text{rd}}$  of the resistance of FIB deposited Platinum at 4-5  $\Omega/\text{sq}$  ( $1\mu\text{m}$  thick).

<http://www.nanosopeservices.com/services.html#29>

- plastic package de-cap
- re-passivation of FIB fixes before plastic packaging
- power bus re-routing using copper deposition.

Click here <http://www.nanoscopeservices.com/job.html#4>

## New Technique Introduction

### CRYO-DualBeam

NanoScope (and partners) are proud to introduce a completely new technique for Scientists interested in soft materials. CRYO-DualBeam is a unique combination of Cryo preparation of sensitive materials, Focused Ion Beam 'site specific' sectioning and Field Emission SEM inspection. Those who may benefit from this new technique are primarily Biologists and Materials Scientists, but there are also some



potential advantages for the **characterisation of 'low k' dielectric materials**. Cryo-DualBeam removes the long-established limitations of conventional Cryo-SEM inspection which relies heavily on advantageous fracturing to produce a clean surface through the feature of interest. Site specific FIB sectioning means that a feature either on, or below, the surface can be cross sectioned immediately for direct inspection/analysis by SEM.

NanoScope Engineers were the first to successfully pilot this technique and to develop the protocols for the successful processing of delicate samples without artefacts. Images of samples successfully prepared by Cryo-DualBeam are available from our image library - <http://www.nanoscopeservices.com/gpage.html>

This new technique is **exclusively available** in Europe through NanoScope Services Ltd. and we also offer consultancy and system training courses for those who wish to learn more.

More information at <http://www.nanoscopeservices.com/services.html#108>

## Report from our business year 2006-7

NanoScope grew significantly in the last 4 quarters - we have managed to move successfully from our 'startup phase' and are now adding additional resources and new equipment to our lab. Our August summer shutdown period, proved to be **our busiest period of the year** with several accounts 'taping-out', so our staff holidays had to be postponed till later in the year! We will keep you updated as new techniques come on line - and we continue to welcome your requests for techniques you need to help your projects directly. Send your suggestions to [Contact@NanoScopeServices.com](mailto:Contact@NanoScopeServices.com)

## Alternative FIB micro-machining examples - exclusively for NanoScope customers

As an interesting example of how Focused Ion Beam micro(nano)-machining can be employed for non-technical applications - NanoScope is offering to Nano-Engineer 'other materials' with a custom pattern. Originally used for nano-imprint applications this can provide a useful and highly visual introduction to the capabilities of charged particle machining. Maybe for a science project at school (as in this case), or an example slide for a presentation, or even a unique way to celebrate a special occasion (wedding, christening etc). We return your 'sample' to you with the design added and a high resolution digital image and optional referenced measurements. Just £200 or 300€.

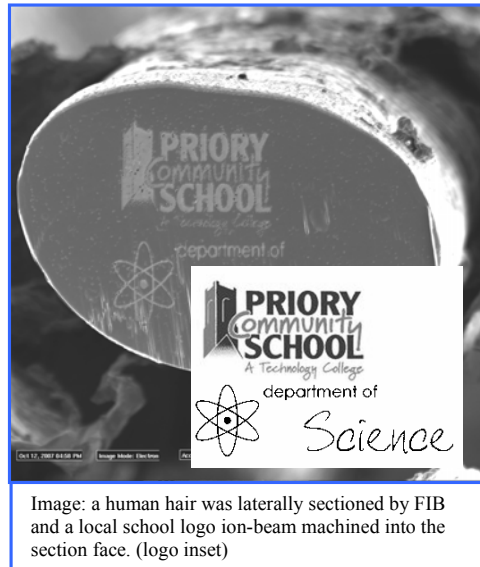
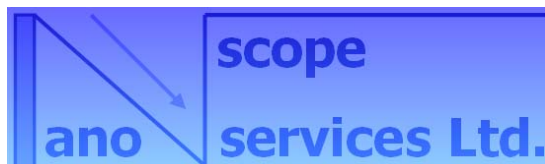


Image: a human hair was laterally sectioned by FIB and a local school logo ion-beam machined into the section face. (logo inset)



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## Still the best value

In a recent like-4-like comparison, NanoScope completed the same FIB modification for a specific customer in 40% less time than 2 alternative laboratories attempting the same work simultaneously. We also returned the job 2 days faster. In a direct 'price per result' comparison we continue to routinely offer the best value and the highest level of service and response.