

Marco Polo Symposium 2009

Non-destructive investigation and large area thin film preparation technique (ArIS) of small samples

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Non-destructive Analyses

Non-destructive Analyses



The measurement doesn't consume the sample

No sample preparation required

- no Carbon coating
- no surface polishing

No heating or other alteration of the sample

Non-destructive Analyses



The measurement doesn't consume the sample

No sample preparation required

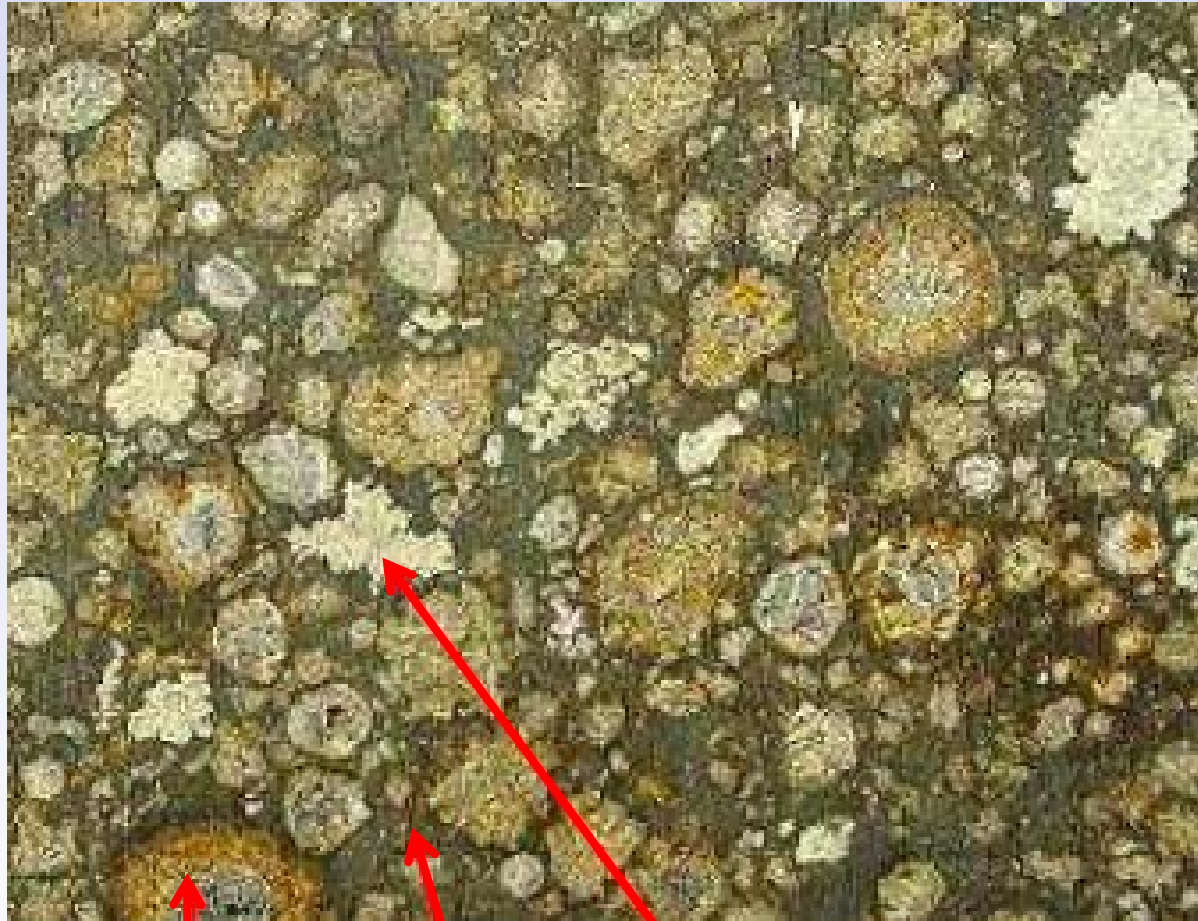
no sample coating
no surface polishing

No heating or other alteration of the sample

**Obviously the first thing to do
in any sample return mission**

Pristin asteroidal sample material

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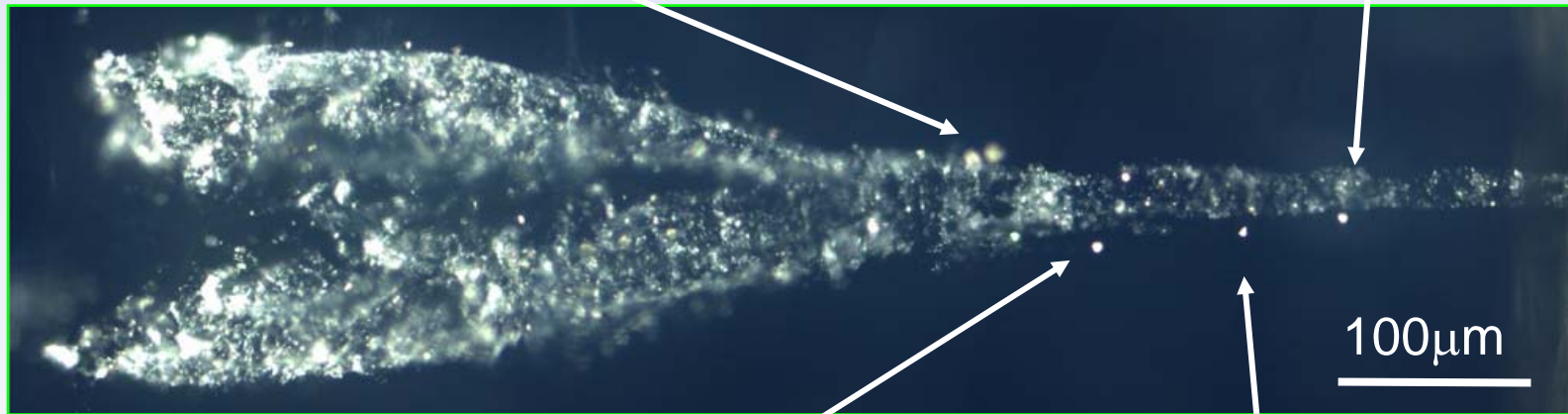
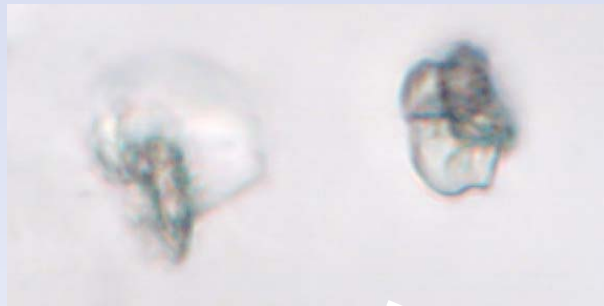
Chondrule

Matrix

CAI

1 mm

Non-destructive S-XRF and S-XRD at Stardust samples



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European Synchrotron Radiation Facility



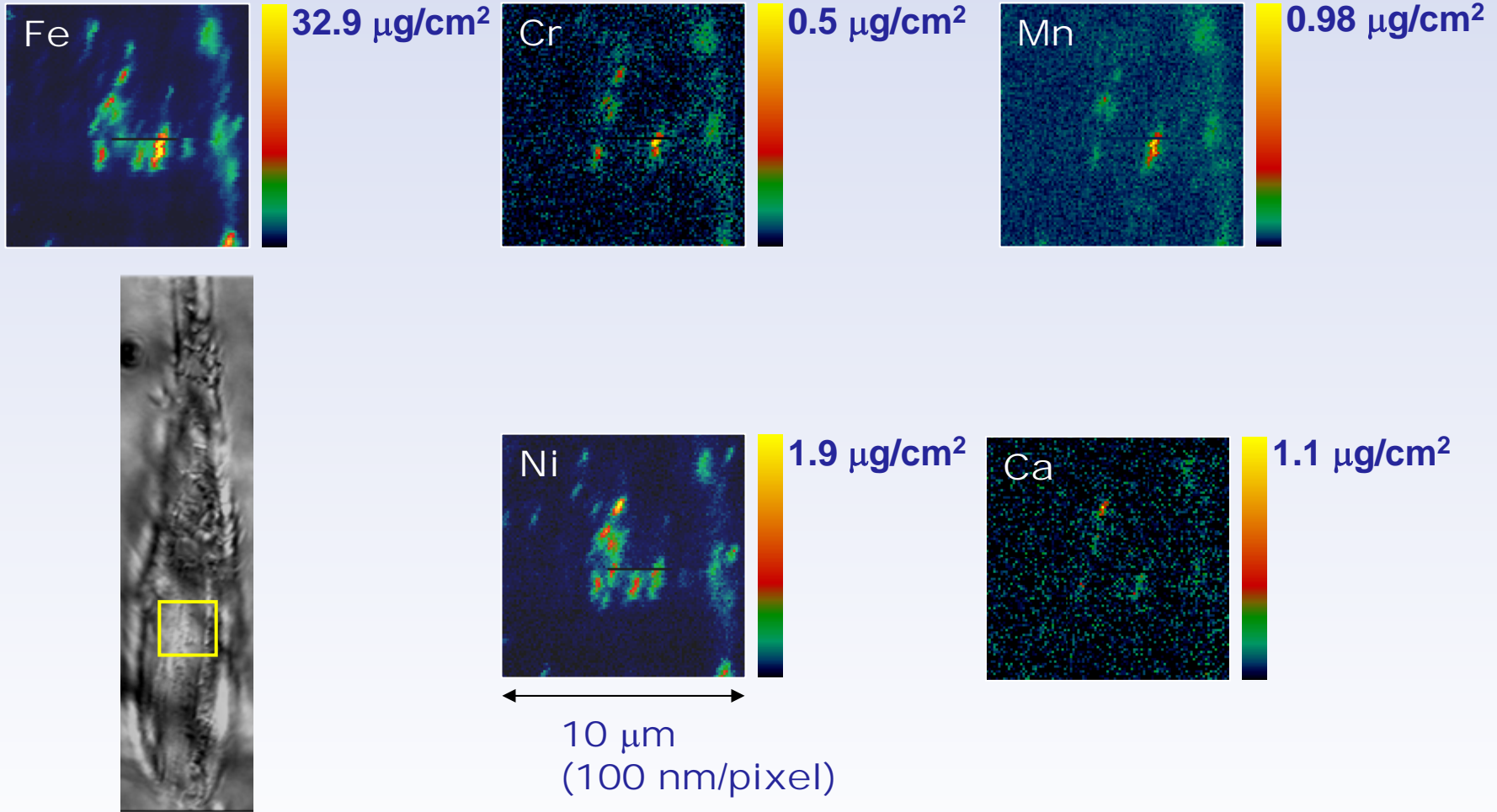
GOETHE
UNIVERSITÄT
FRANKFURT AM MAIN



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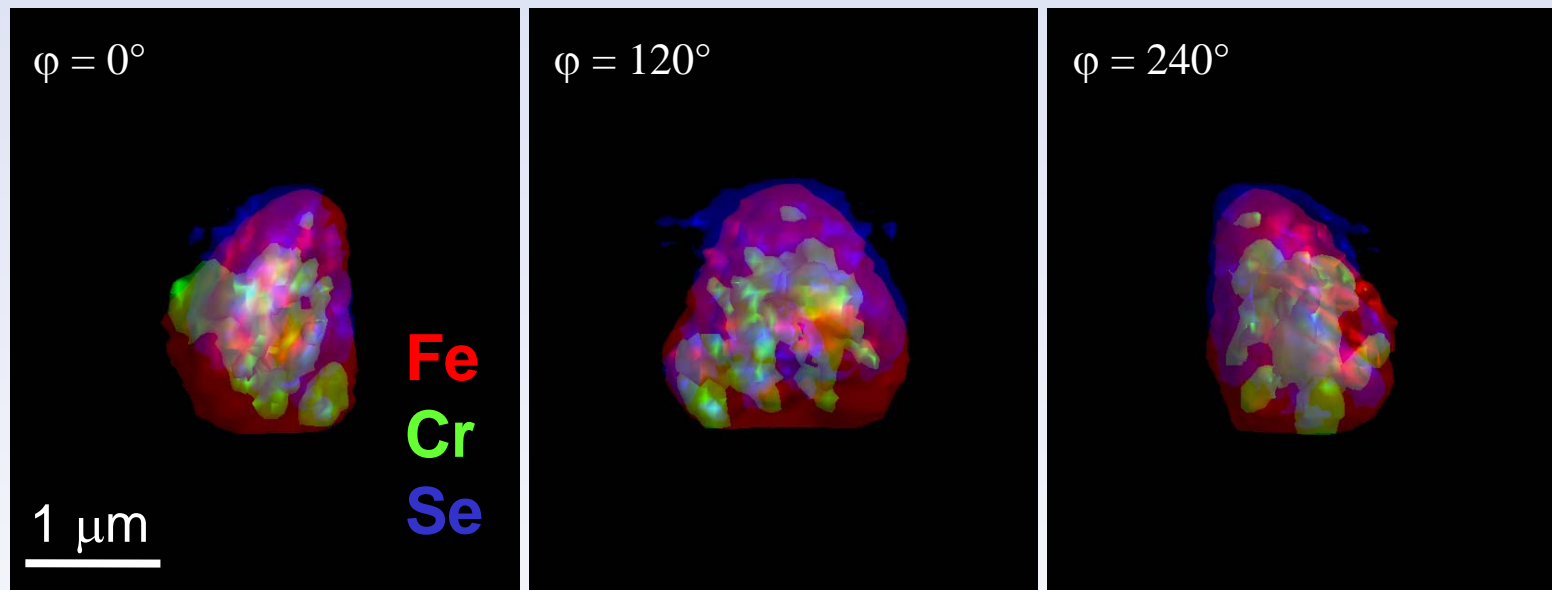
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Non-destructive S-XRF and S-XRD down to the nanoscale



Brenker et al. 2009

Non-destructive S-XRF and S-XRD down to the nanoscale



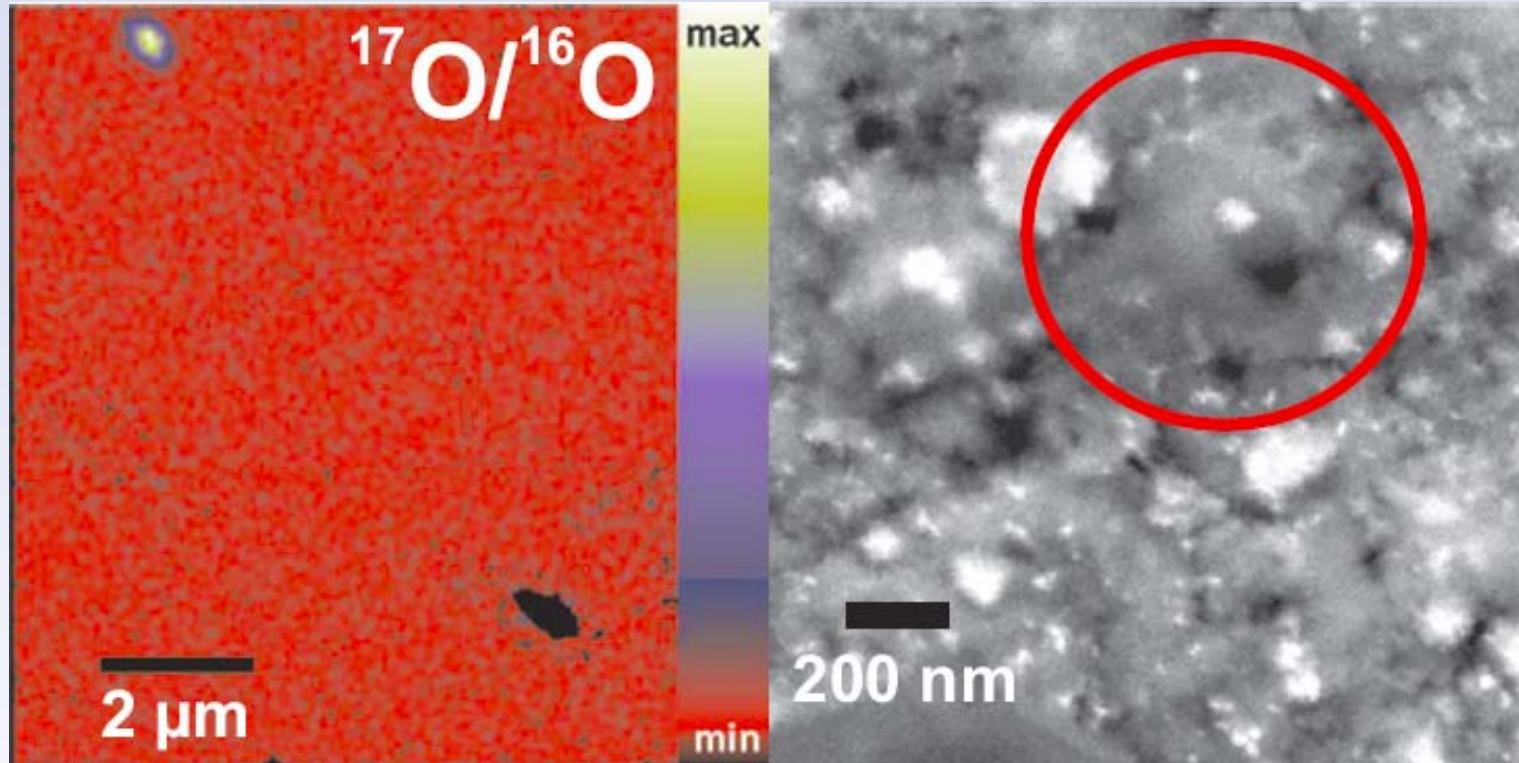
Not bad, but...

Not bad, but...

**No isotopic information!
Only limited structural information!**

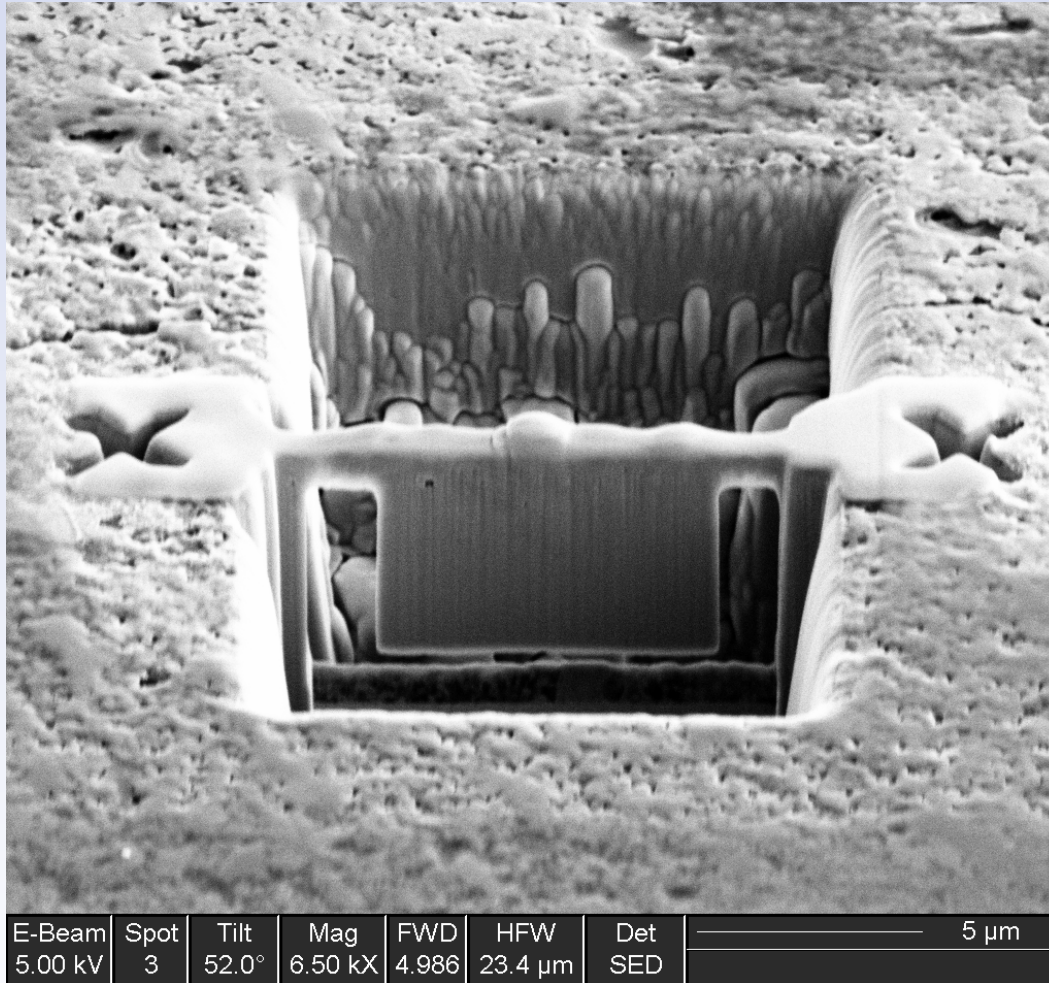
**Thus, sample manipulation is needed
at a certain point**

Nano-SIMS on circum stellar grains



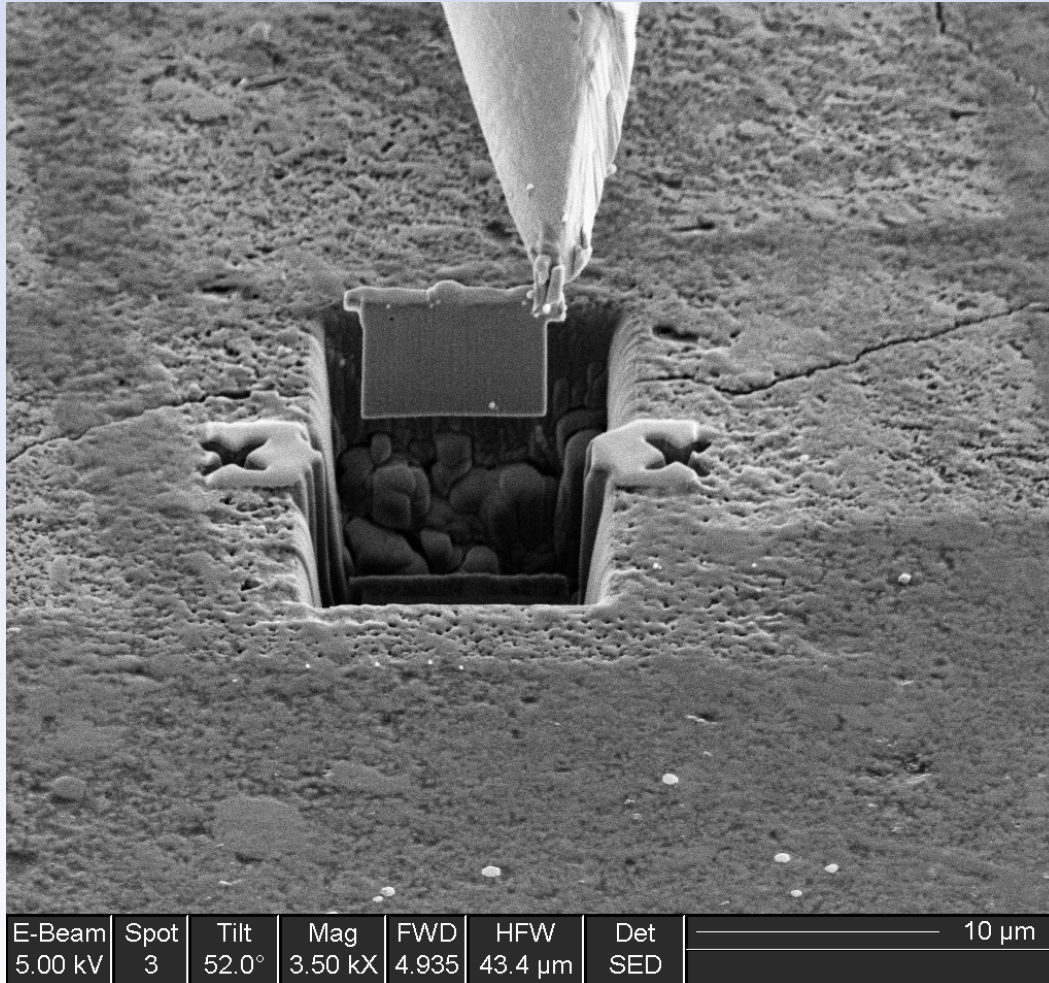
Vollmer et al., 2007

FIB – Sample Preparation



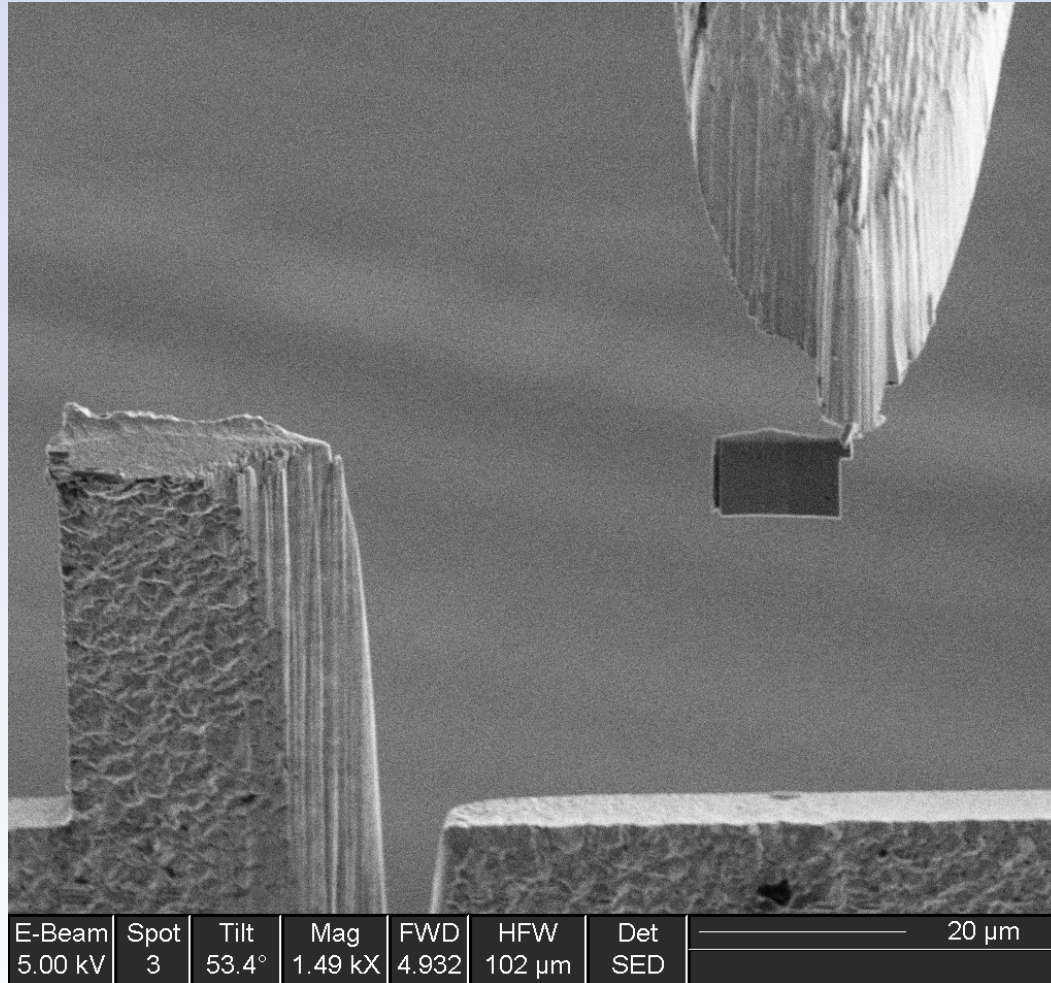
Vollmer, Diss. 2008

FIB – Sample Preparation



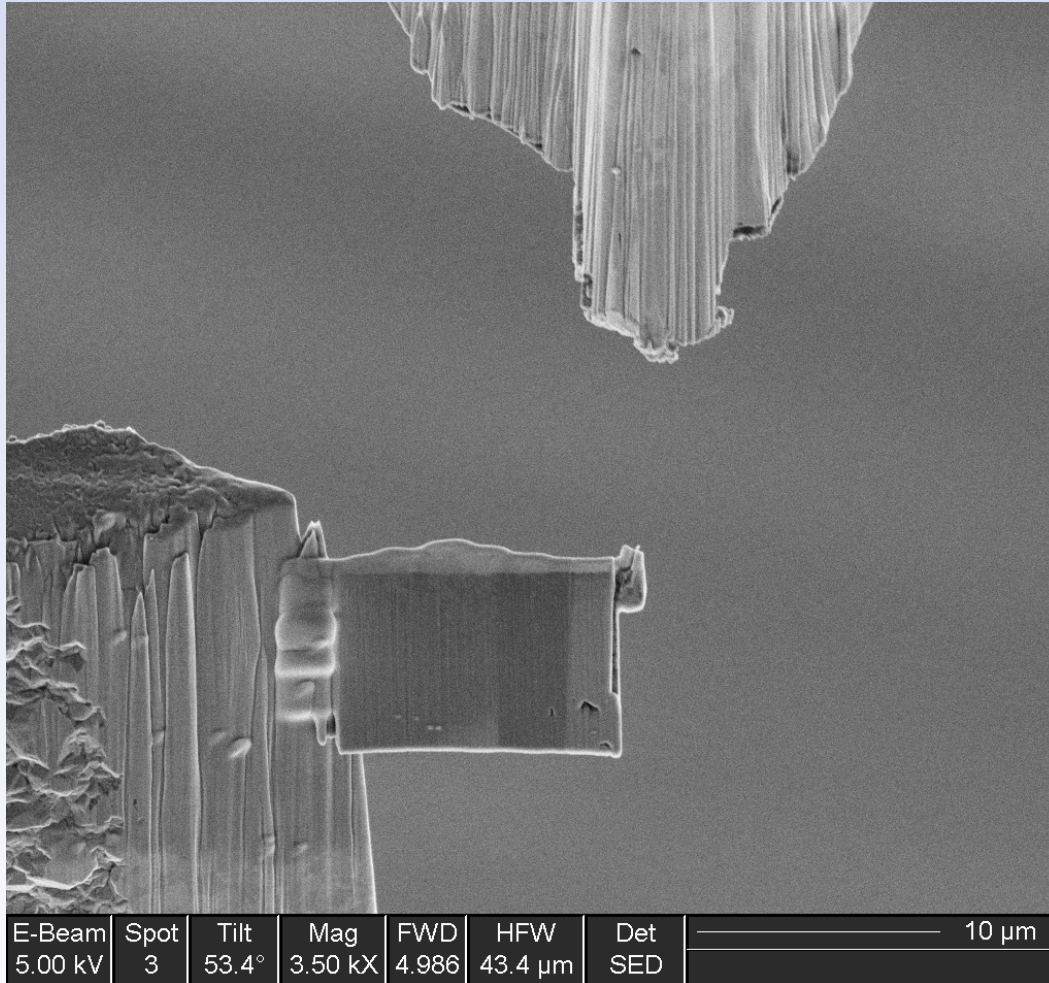
Vollmer, Diss. 2008

FIB – Sample Preparation



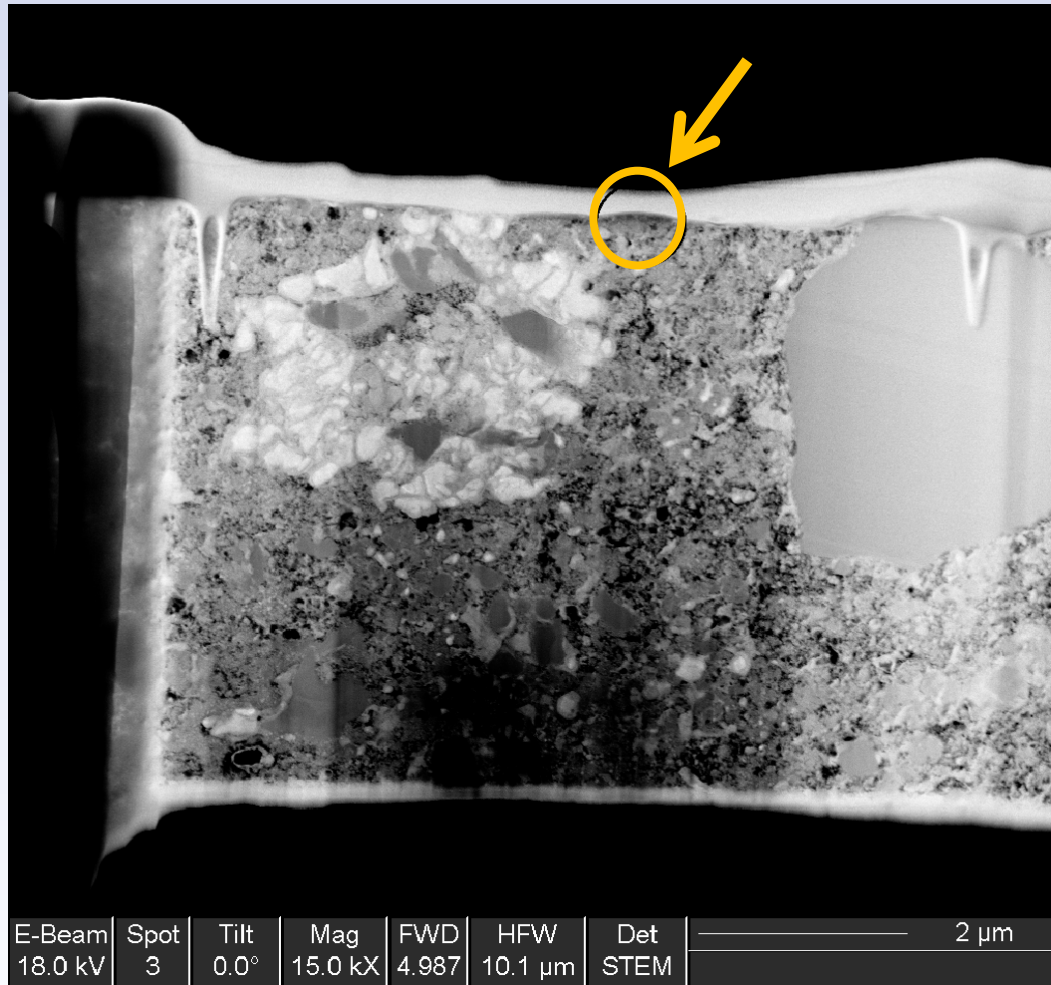
Vollmer, Diss. 2008

FIB – Sample Preparation



Vollmer, Diss. 2008

FIB – Sample preparation



Vollmer, Diss. 2008



Not bad, but...

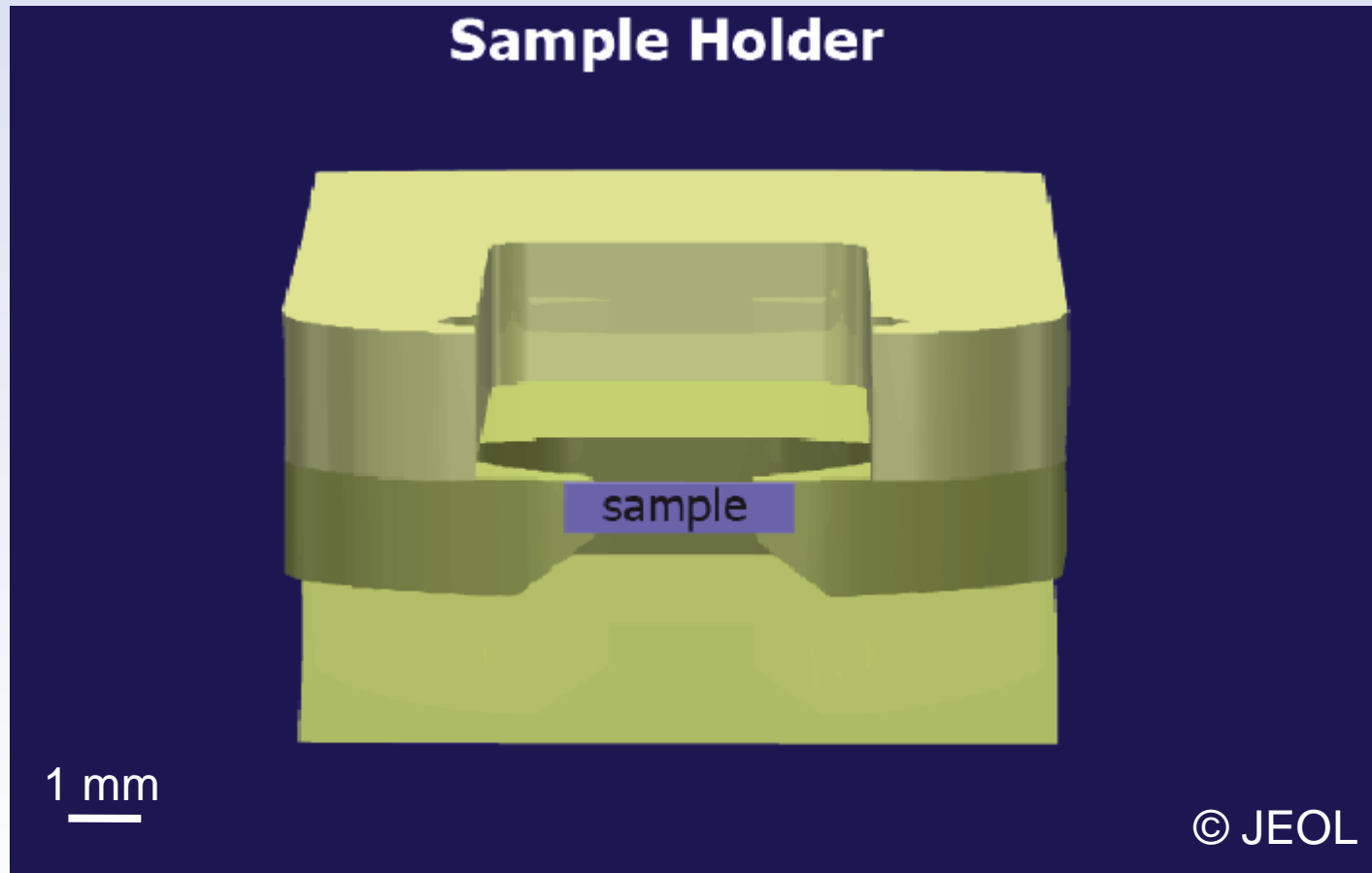
Not bad, but...

You first have to know what is important!

**Thus, the better way: Make the whole sample
electron transparent!**

New approach: Large Area Thin Film preparation Argon Ion Slicing - ArIS

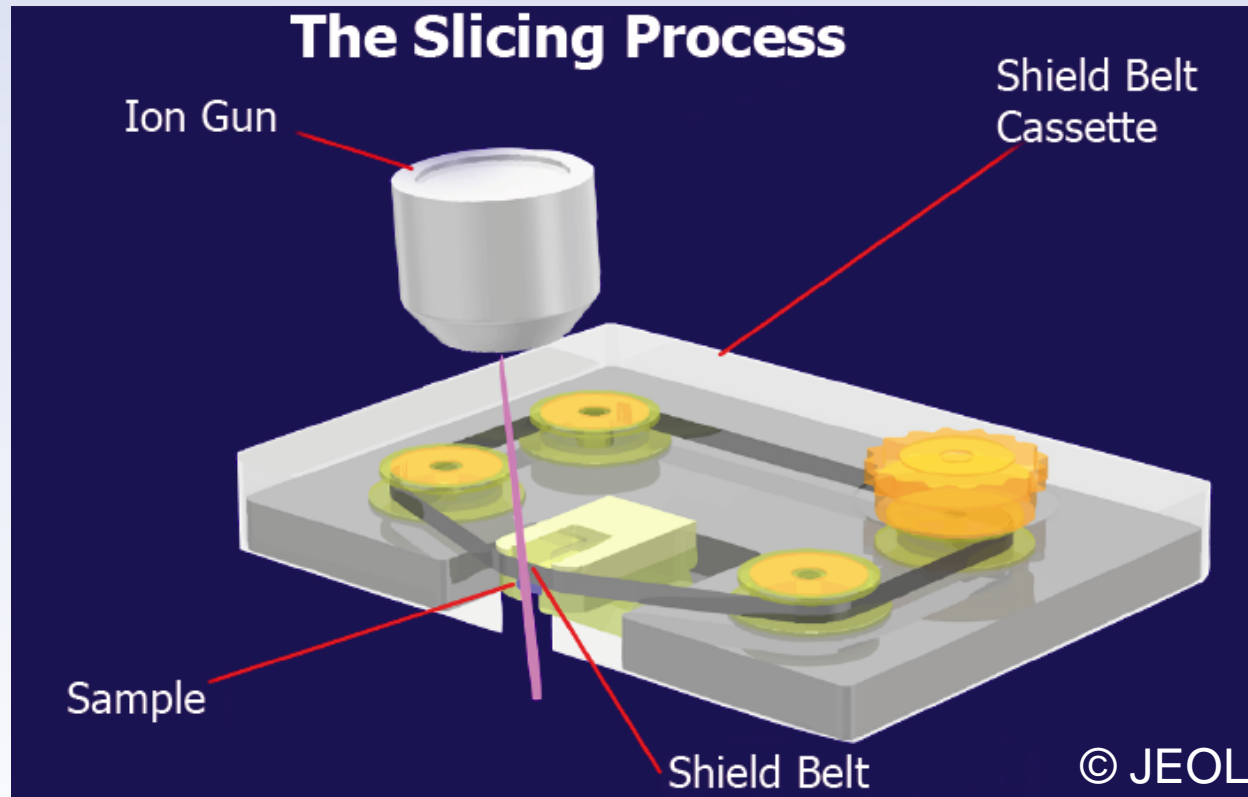
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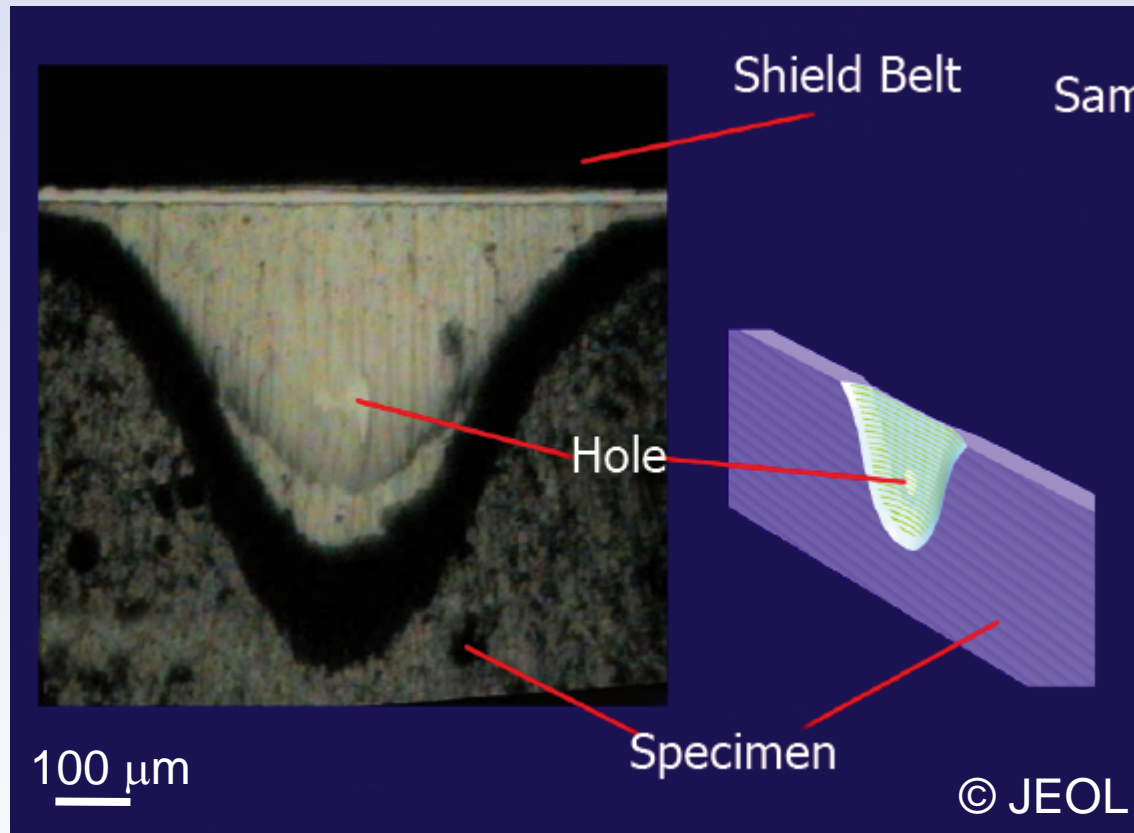
Large Area Thin Film preparation

Argon Ion Slicing - ArIS

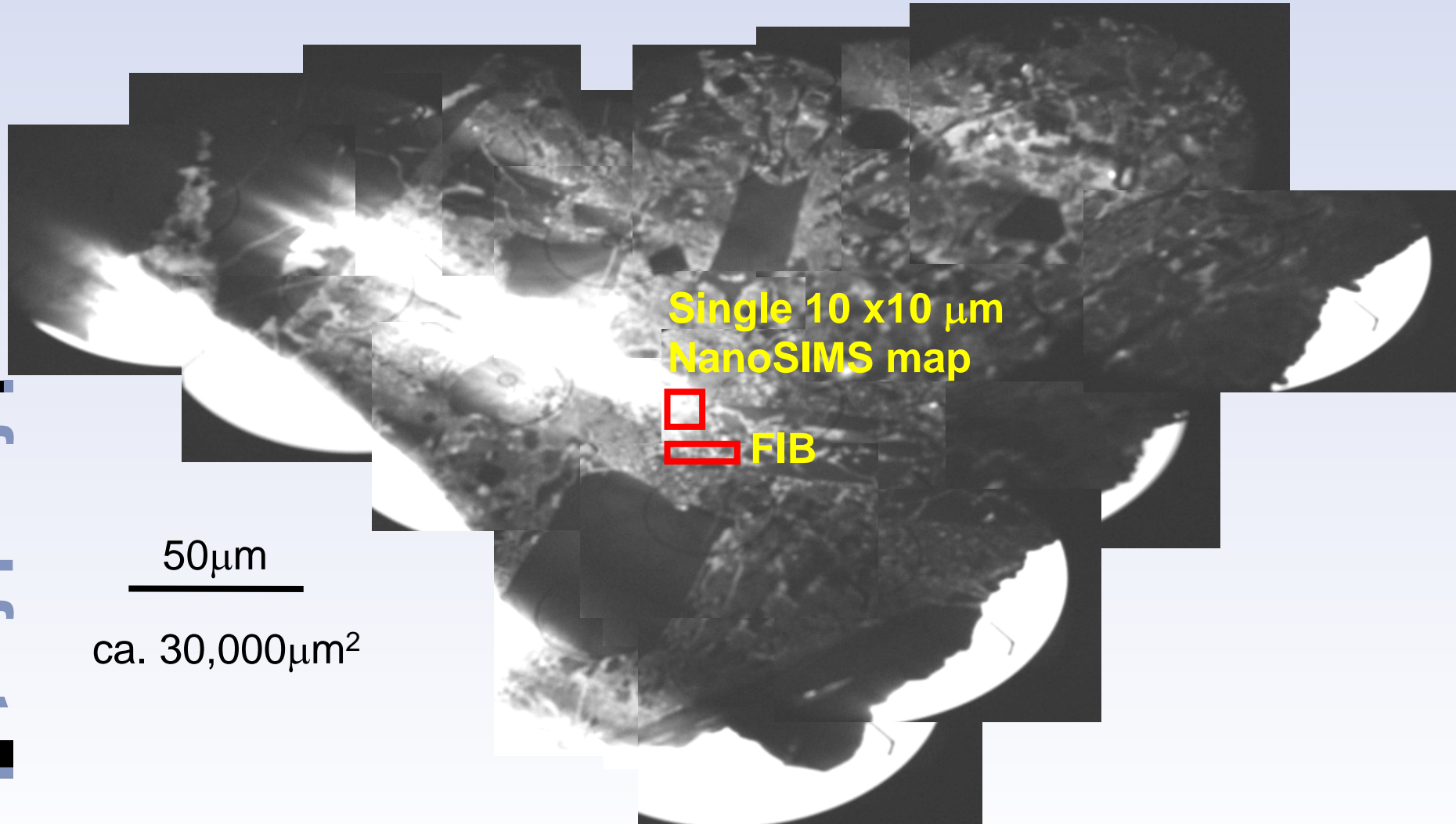
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Large Area Thin Film preparation Argon Ion Slicing - ArIS



Argon Ion Slicing - ArIS



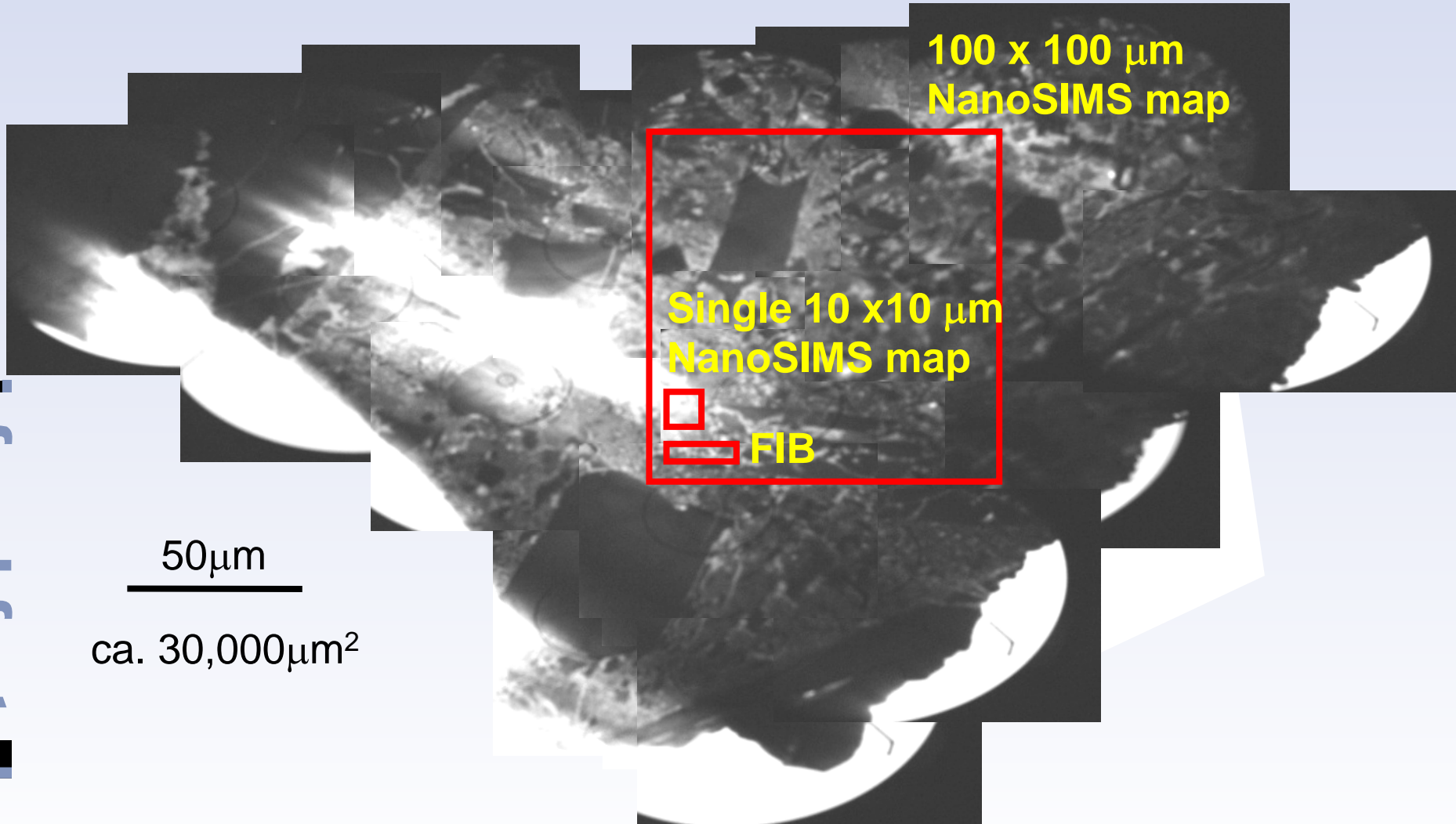
Single 10 x 10 μm
NanoSIMS map

FIB

50 μm

ca. 30,000 μm^2

Argon Ion Slicing - ArIS





Not bad, but...

Not bad, but...

Your turn! We need samples!

**Thus, good luck and thank you for
your attention!**