

Particulate Contamination Analysis via Scanning Electron Microscopy

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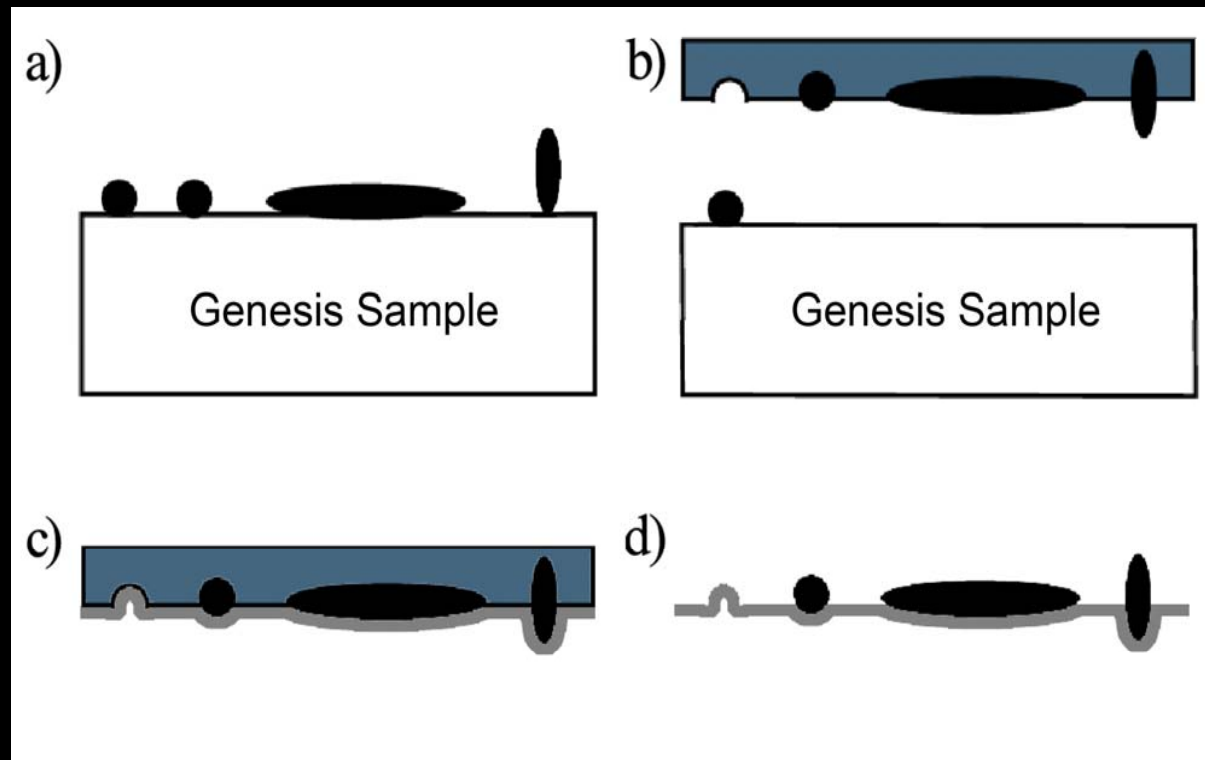
March 22, 2009

Overview

- Review of Carbon extraction replicas
- TEM sample of 60121
- Replica Cleaning of acid etched – 60125
- Replica Cleaning of SAP 50719
- Conclusions

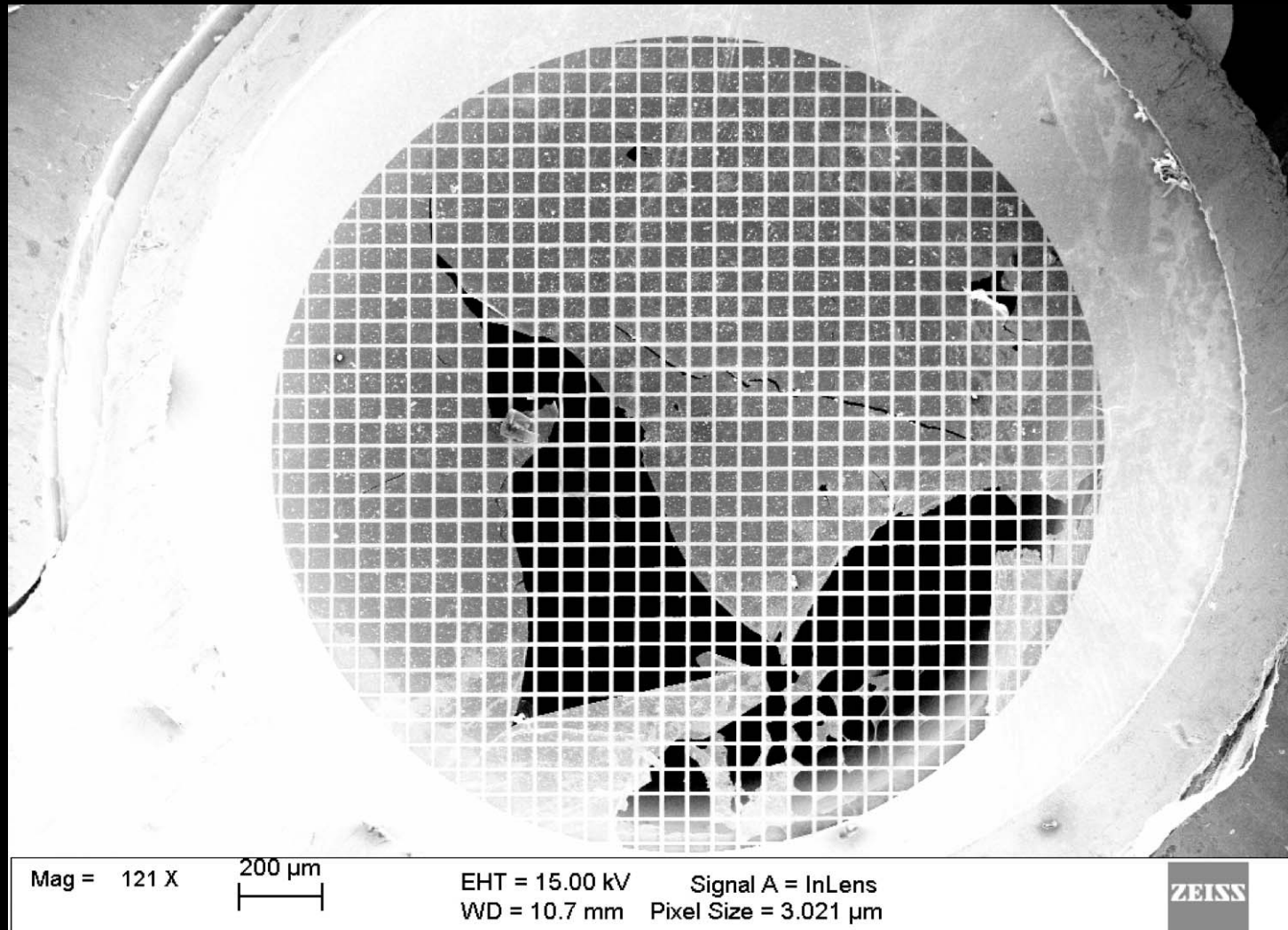
Extraction Replicas

- a) "Dirty" Genesis sample
- b) Cellulose acetate replica film wetted with acetone applied to and removed from sample
- c) Replica coated with 60 nm of carbon
- d) Replica with cellulose acetate film removed by acetone vapor.



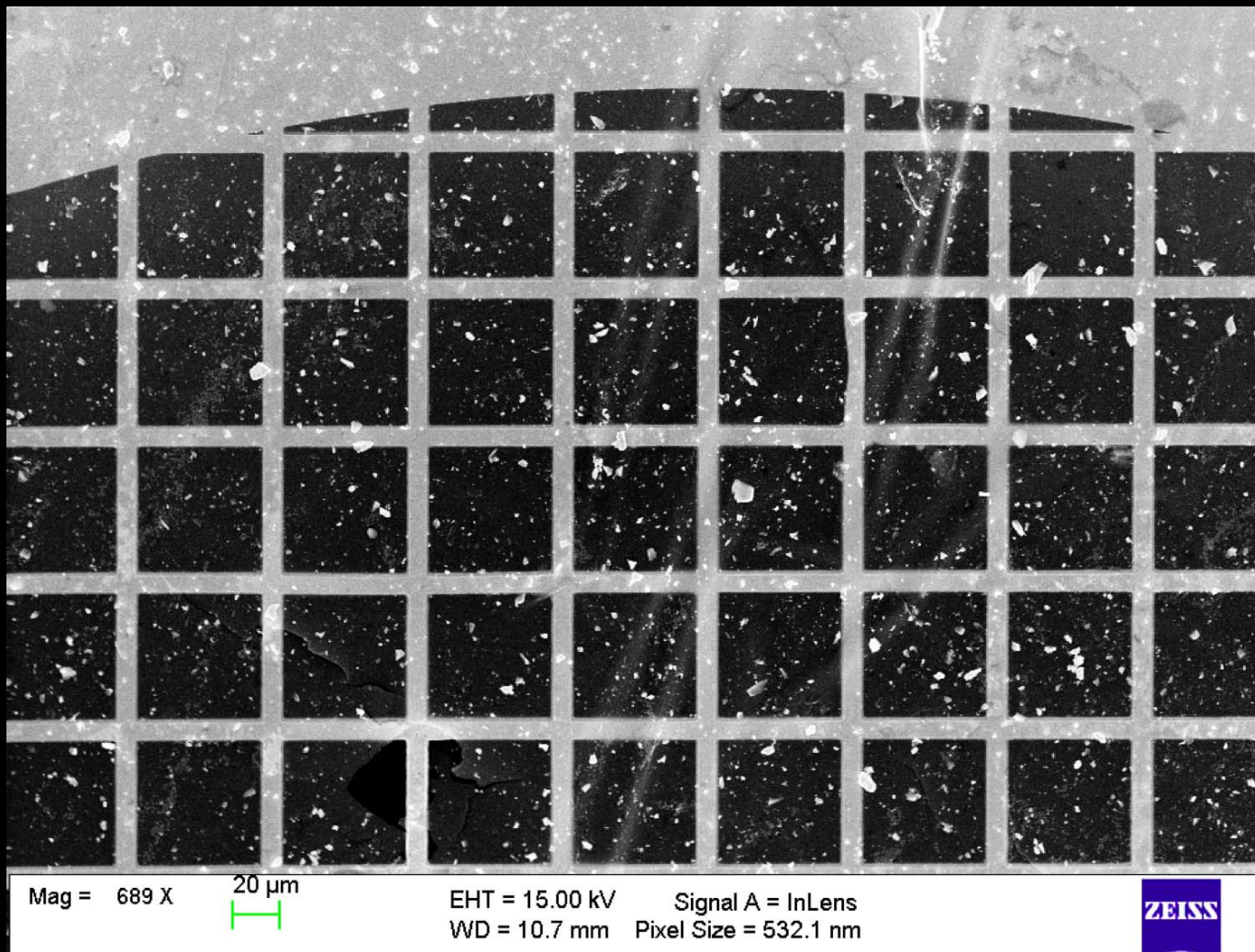
TEM Grid Containing Replica Film

Sample 60121 – Uncleaned Si



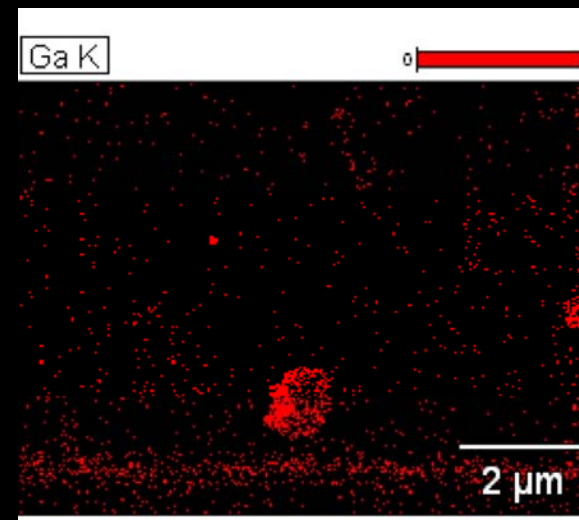
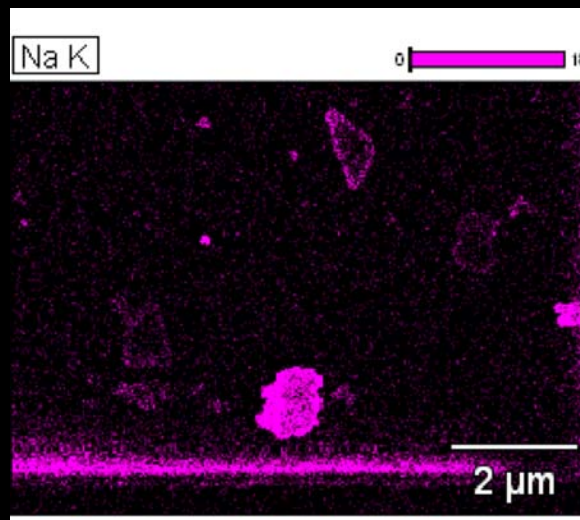
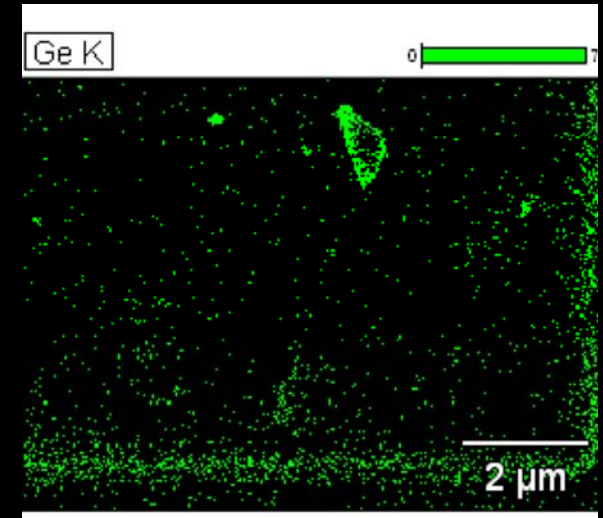
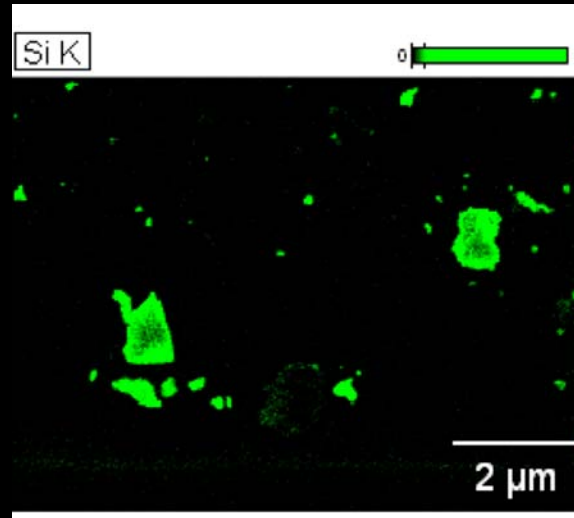
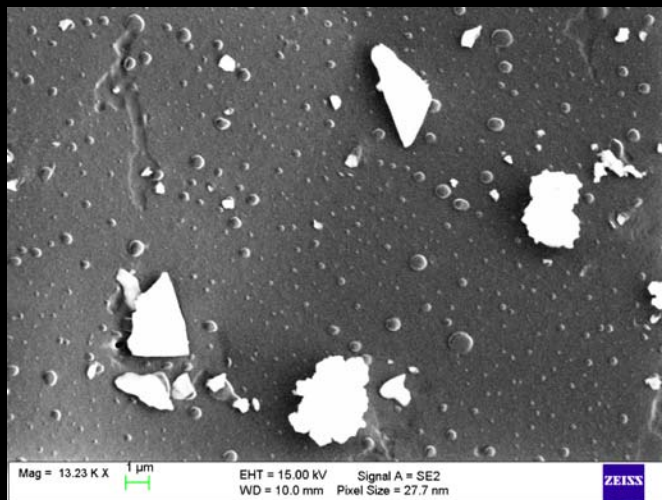
TEM Grid Containing Replica Film

Sample 60121 – Uncleaned Si

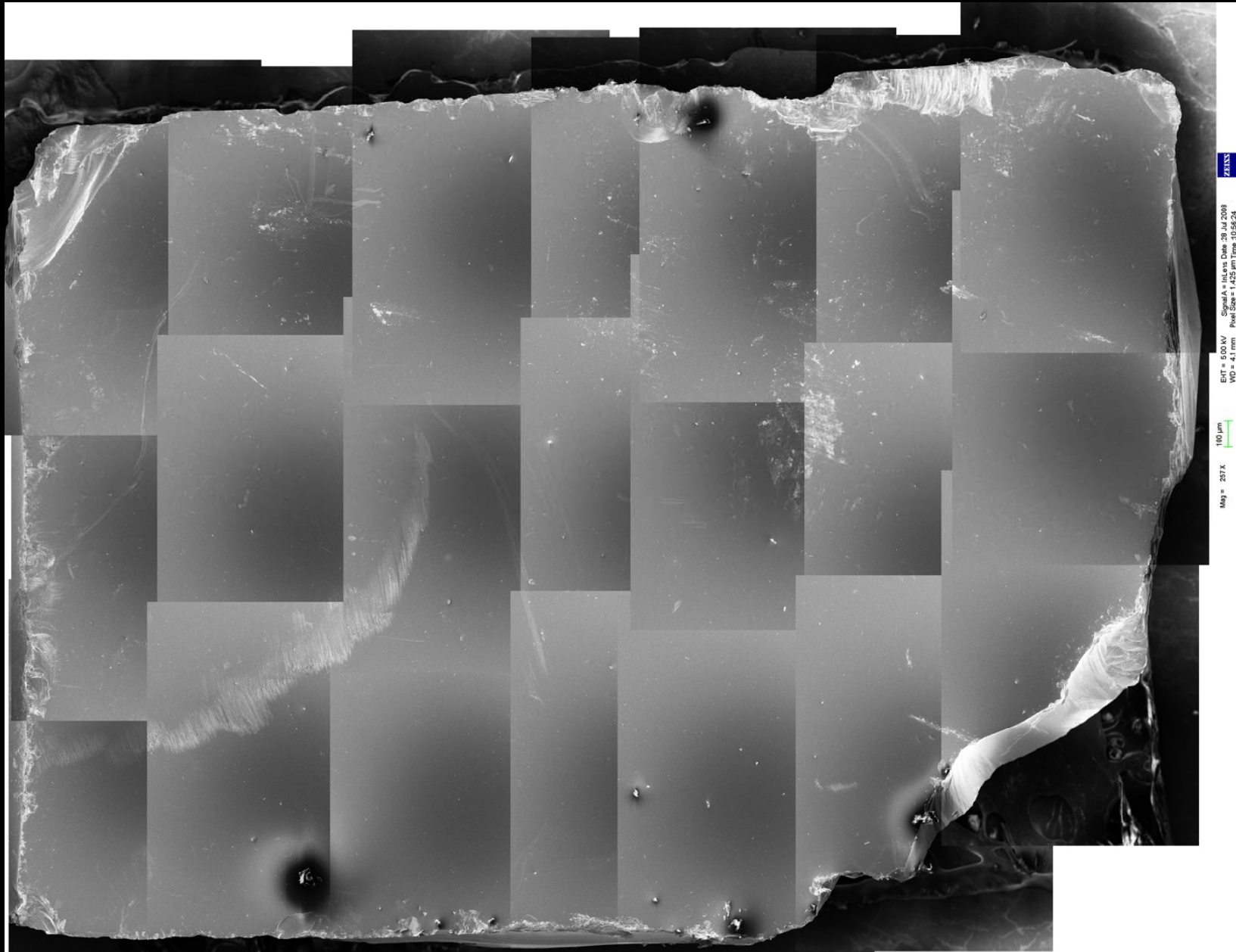


Qualitative EDX Analysis of Extracted Particles

Sample 60121 – Uncleaned Si

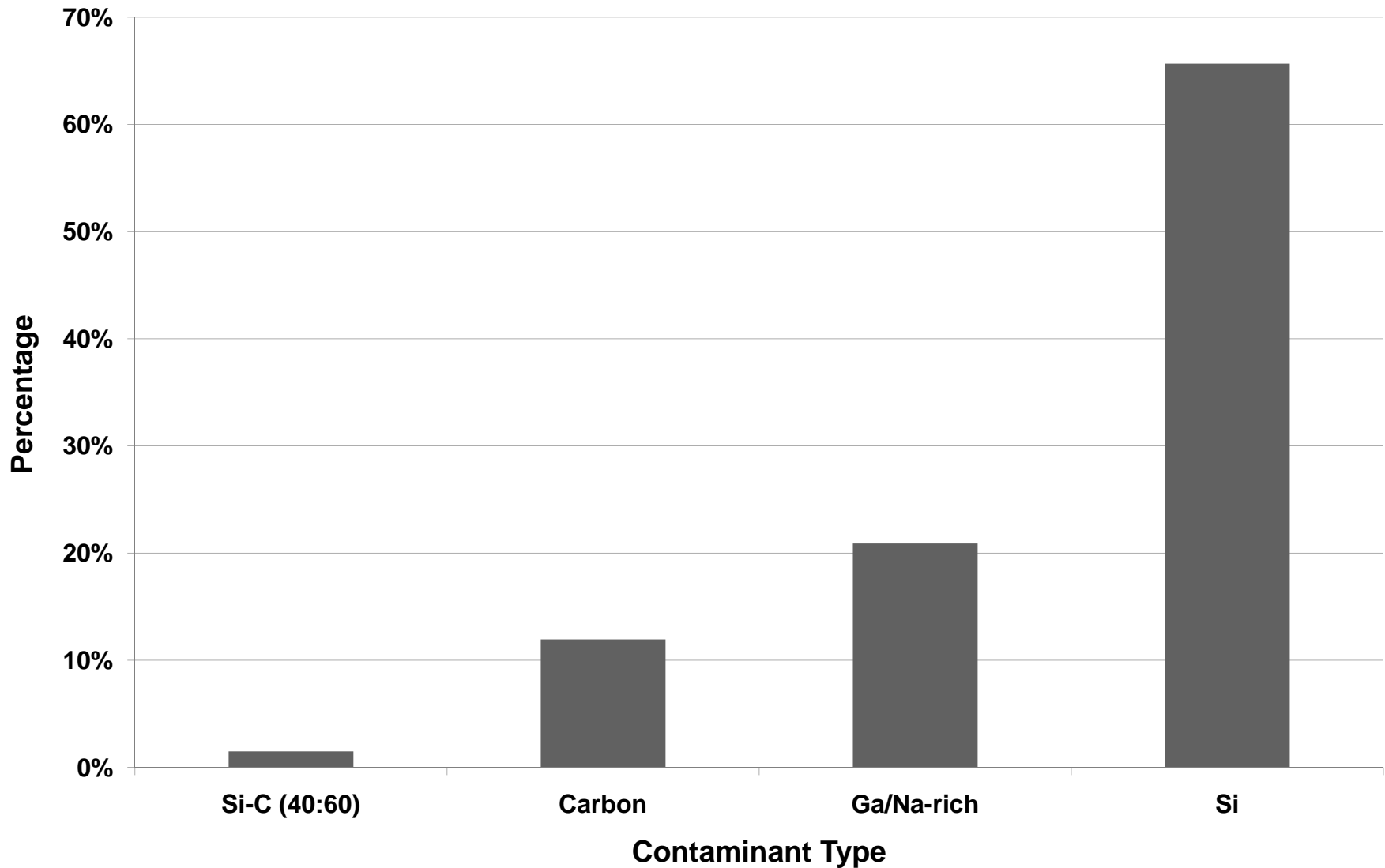


Analysis of Acid-etched Si 60125

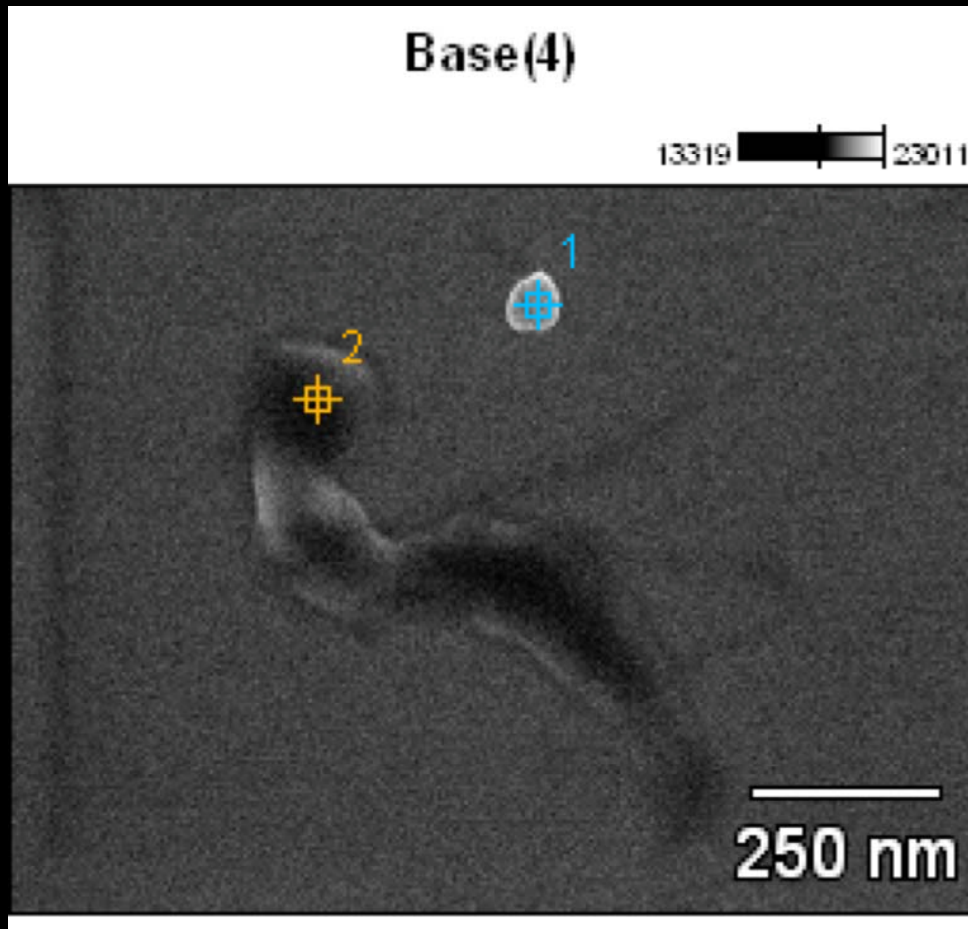


Analysis of Acid-etched Si 60125

Submicron Contamination of 60125



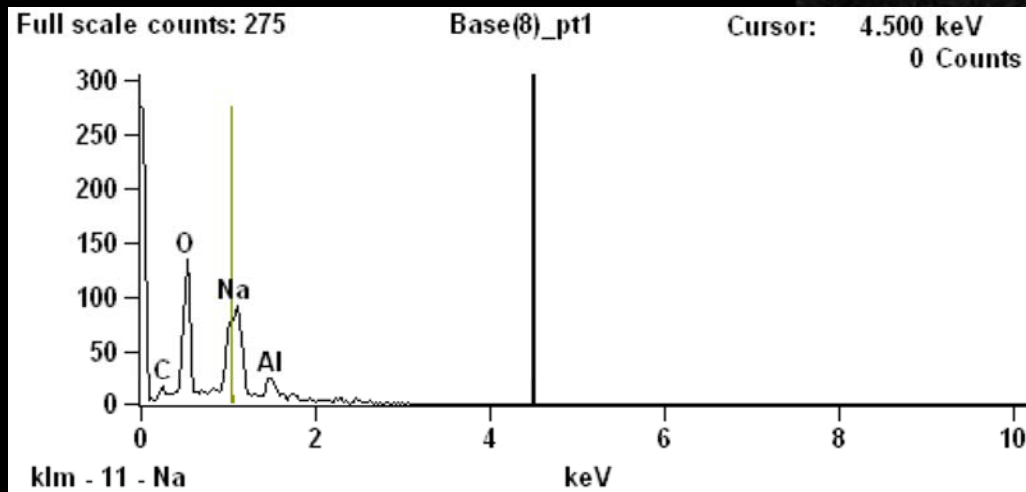
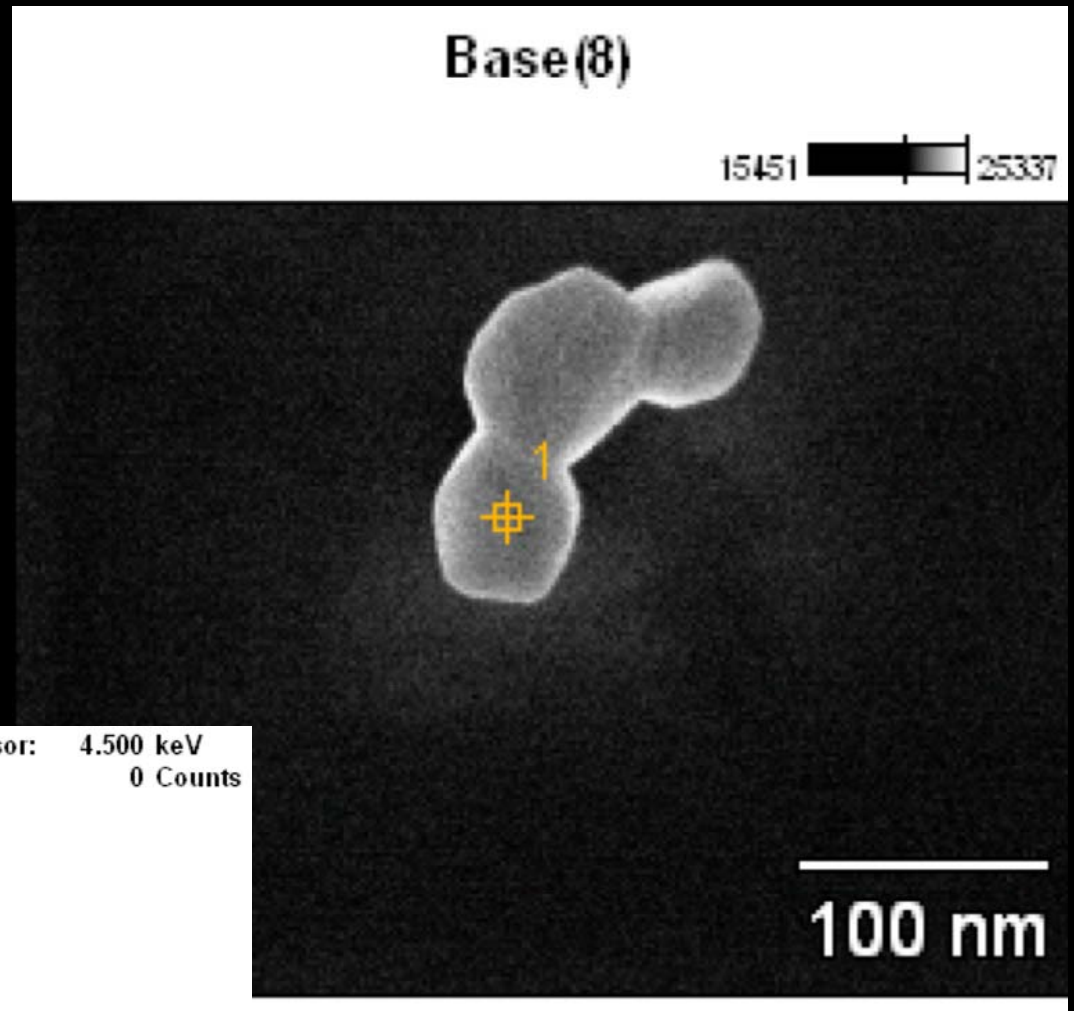
Analysis of Acid-etched Si 60125



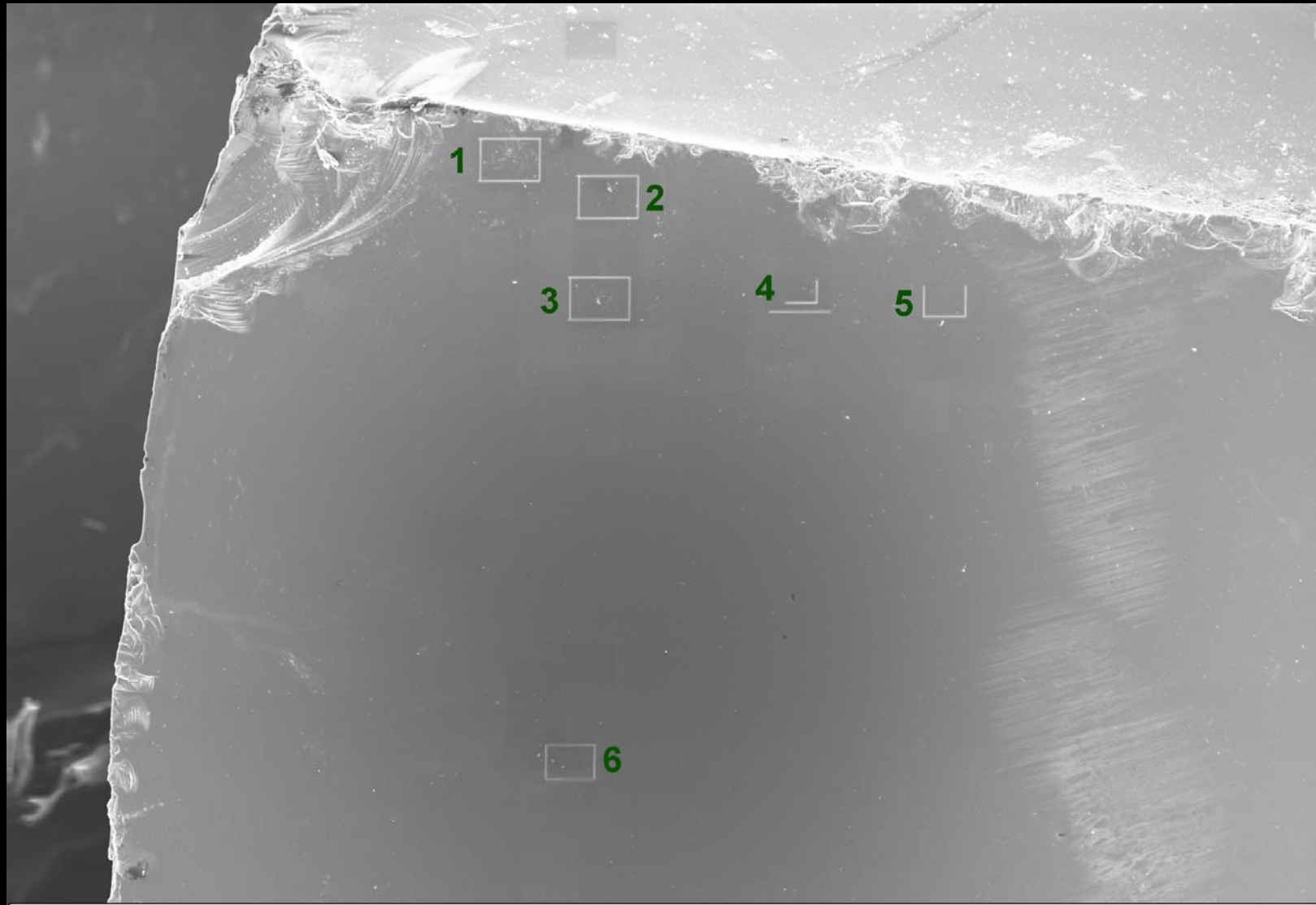
1 – Silicon

2 - Carbon

Paint Particle - Acid-etched Si 60125



Focused Ion Beam Fiducial Marks



Mag = 385 X

100 μ m



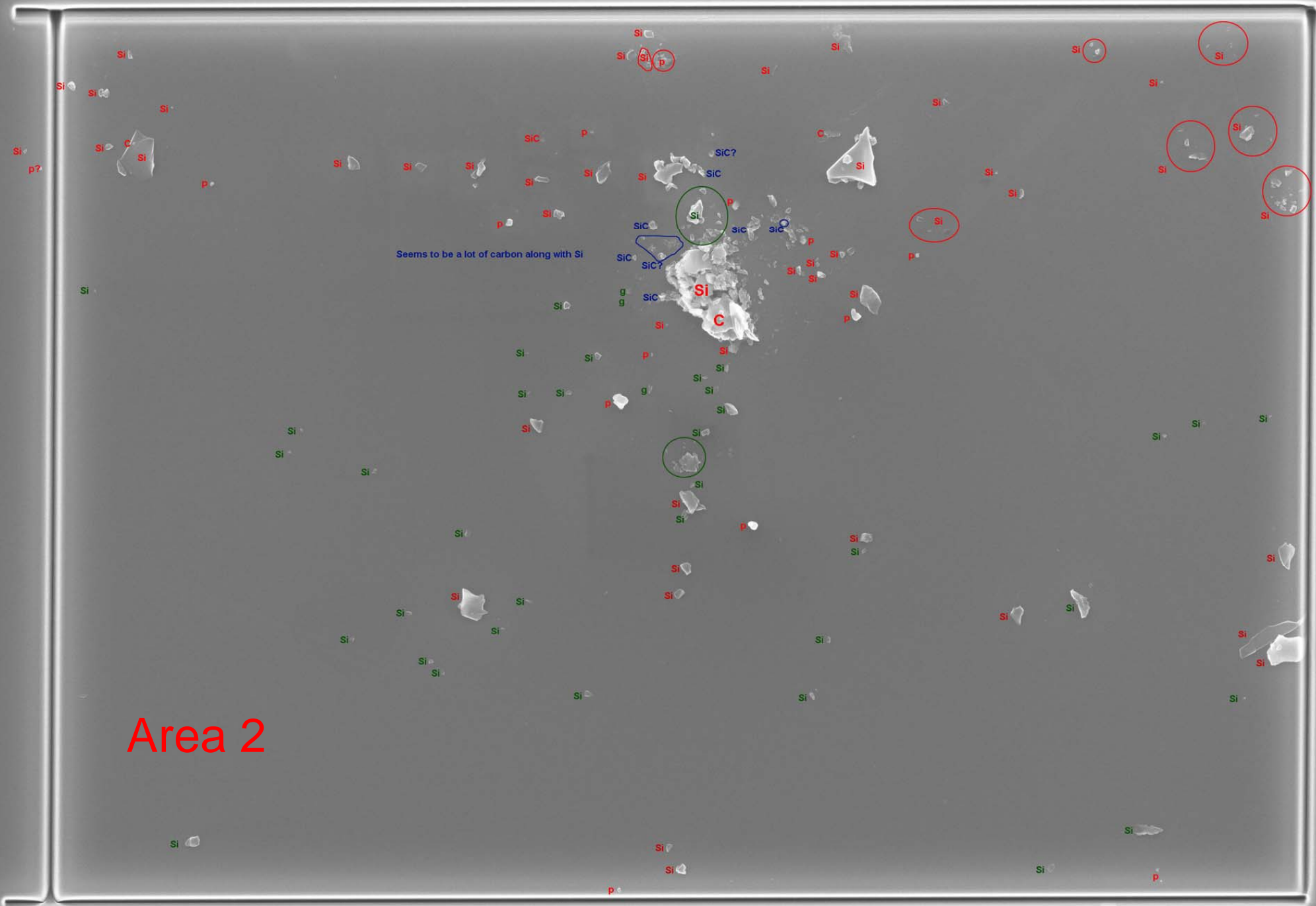
EHT = 15.00 kV

Signal A = InLens Date : 14 Jan 2009

WD = 6.0 mm

Pixel Size = 953.1 nm Time : 10:32:47





Area 2

Mag = 7.69 K X

2 μ m
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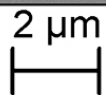
EHT = 15.00 kV
WD = 6.0 mm

Signal A = InLens Date :14 Jan 2009
Pixel Size = 47.7 nm Time :10:43:49



Area 2

Mag = 7.68 K X



EHT = 15.00 kV

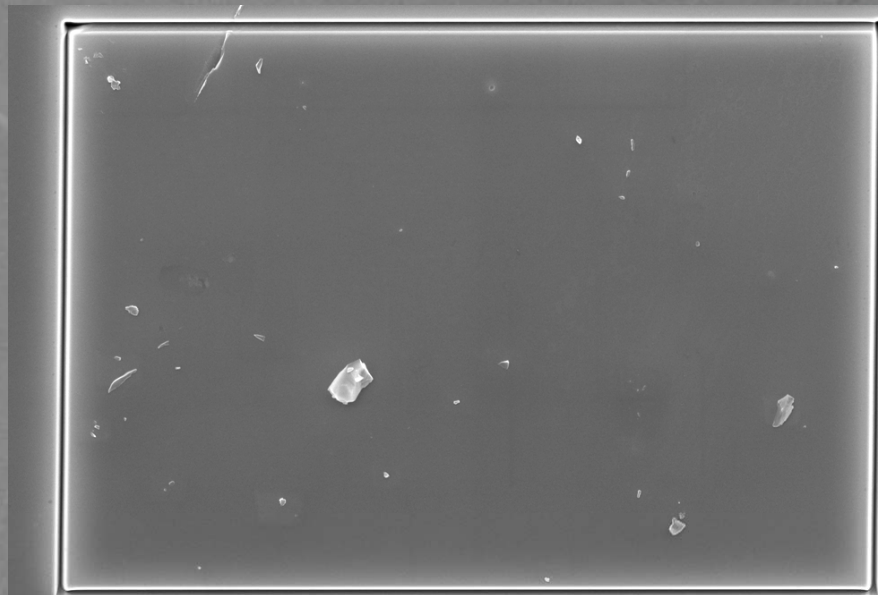
WD = 5.7 mm

Signal A = InLens Date :18 Feb 2009

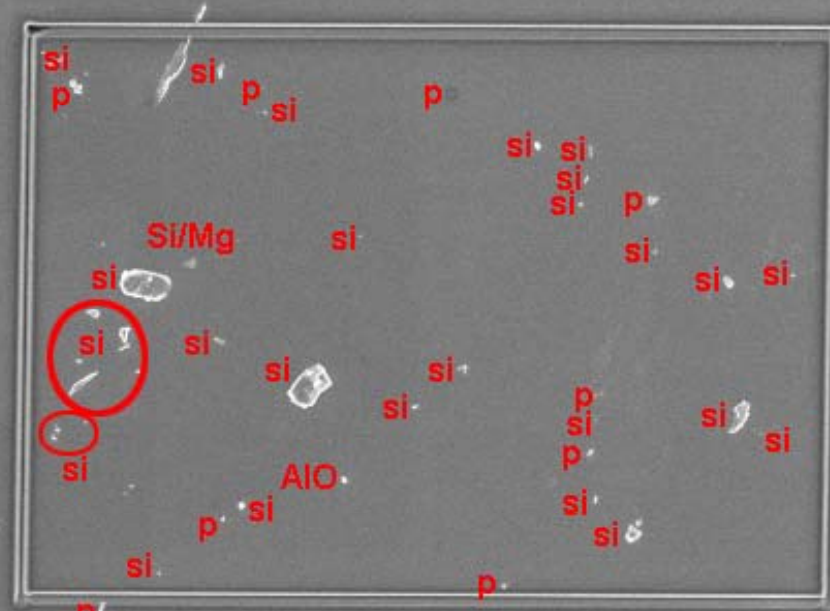
Pixel Size = 47.8 nm Time :10:39:22



Mapped Area 6 of Acid-etched Si 60125 - Replica



Mag = 9.45 K X 2 μ m EHT = 15.00 kV Signal A = InLens Date :23 Feb 2009
WD = 5.7 mm Pixel Size = 38.8 nm Time :14:57:46



si

si
si

Mag = 3.89 K X

10 μ m

EHT = 3.00 kV
WD = 5.1 mm

Signal A = InLens Date :31 Dec 2008
Pixel Size = 94.3 nm Time :14:04:41



Conclusions

- Cellulose acetate replicas are effective in removing particles from Genesis samples.
- SEM can be used to qualitatively measure the contribution of each type of particulate.
- Replica films can only remove some of the particles from acid-etched samples. It is hypothesized that the acid-etching may create a “glue” for some of the particles.

Acknowledgements

- This work was sponsored by the SRLIDAP Program, NASA HQ and the Genesis Project at JPL
- We wish to thank Prof. Gerald Kulcinski of the University of Wisconsin for providing laboratory facilities for this work.

Questions?