Fast images of FIB x-sections using a CFESEM with BSE-TTL-detection

all samples uncoated and unetched

K. Reischle, L. Gress, Dr. K. Burger

ATMEL Germany GmbH
Theresienstr. 2
D-74072 Heilbronn
Fast images of FIB x-sections using a CFESEM with BSE-TTL-detection

- Equipment
- Specimen mounting
- 1<sup>st</sup> x-section
  metal lines and steel particle
  (optical microscopy)
- 2<sup>nd</sup> x-section
  capacitor edge, dielectric defect
  (emission microscopy)
specimen exchange chamber and specimen mounting

15 mm stubs (3mm pin)
easy specimen exchange with 70°, 75 or 80° tilted sample holder adapter

FESEM with fast specimen exchange procedure
FIB x-section position near to the specimen edge for low SEM working distances specimen mounting with conductive carbon cement
particle between barrier and metal 1

optical microscope

FESEM lower detector

optical microscope

FESEM lower detector 60° tilt
particle between barrier and metal 1

FIB x-sections & CFESEM

FIB

FESEM lower detector good focus depth 75° pretilt sample holder

FESEM upper detector low angle BSE

FESEM upper detector low angle BSE low working distance 75° pretilt
particle between barrier and metal 1

EDX-spectrum

TiN anti reflective coating
metal 2
metal 1
TiN barrier

high-grade steel particle precipitated after TiN barrier and before metal 1
dielectric damage at capacitor edge
dielectric damage at capacitor edge

The ion beam copies the topography of the surface to the point of interest. A great disturbance like a curtain is visible at the surface of the x-section.

The changed tilt between beam and sample surface moves the disturbed area to a less important region.
dielectric damage at capacitor edge

old etch process

modified etch process
more dielectric remaining

new mask additional SiO$_2$ layer protects dielectric layer

new mask additional SiO$_2$ layer protects dielectric layer
Fast images of FIB x-sections using a CFESEM with BSE-TTL-detection

- easy transfer between FIB and SEM
- specimen mounting on a standard 15 mm stubs (3mm pin)
- stub mounting onto a 80° tilted sample adapter
- FIB x-section position near to the specimen edge (low SEM WD)
- FESEM with fast specimen exchange procedure
- FESEM with efficient TTL BSE-detection system at low keV
- **no etching or sputtering needed !!!**
- **1st picture with all needed x-section information within about 10 minutes after FIB polishing !!!**