New features observed with SEM in-lens detector in the vicinity of breakdown craters.

- SE contrasts in LV-SEM. Different features observed by In-lens and E-T detector.

- Examples of worm-like, flowers, spaghetti, filamentary features… (better) observed with In-lens detector
  - RF tested structure. T24 - 11WNSDvg1.8Cu
  - DC spark sample. Cu 45 - 7N-LG
SE contrasts in LV-SEM. Different features observed by In-lens and E-T detector.

Images taken simultaneously and at the same location

→ With In-lens detector superficial contaminations become visible.
SE contrasts in LV-SEM. Different features observed by In-lens and E-T detector.

Cur structure after RF test

Cur sample after DC spark test
SE contrasts in LV-SEM. Different features observed by In-lens and E-T detector.

→ SE signal very sensitive to surface condition and slight chemical differences
“The emission coefficient of SE is very sensitive to the condition of the surface because the low kinetic energy severely limits their range…dependence upon composition can be influenced by the nature of molecular bonds…this dependence should alert the microscopist to the possibility of unexpected contrast effects in SEM images were SE form a large part of the signal such images prepared with the In-lens detector.”

→ In-lens less background of indirect SE produced on walls.
“The positive biased E-T has a strong BSE component in its signal from the SE$_3$ (SE electrons produced when the BSE hit the pole piece and chamber walls).

SE contrasts in LV-SEM. Different features observed by In-lens and E-T detector.

→ In-lens image is more sensitive to lower energy SEs. The In-lens image is mainly composed of low energy electrons whose energy is less than 40 eV and are easily attracted by the electrostatic field generated by $U_B$. This can be the reason why SE images of in-lens detector have high surface sensitivity. For the out-lens the main portion of the SEs have higher energy, thus images contain much (bulk) material information.

T24 - 11WNSDvg1.8Cu

Post mortem SEM inspection

A. Toerklep EN/MME
G. Arnau Izquierdo EN/MME
→ presence of worm-like features around some craters close to the big region with the dirt
Worm-like features
In most of the patches of activity the edges are not sharp but seem to be made of a mess of wrinkled lines

Is it a kind of prelude of breakdown or a form of very soft breakdown?
DC spark – Cu45

7N-LG

EDMS: 1070707

12/04/2010 P.Alknes EN/MME
Sample: 7N-LG Cu (45)  
99.99999 % purity

Sample processing
1. Rough shaping by WDM from blank of 140mm diameter with 20mm thickness.
2. Light etching with acid for removing contamination by WDM.
3. Diamond turning
4. Annealing at 600 deg C./2 hours in vacuum.

Object
- Observe and take SEM images of the sampled spots on sample Cu 45
- Measure the size of all spots.
- BSE image for estimation of grain size and location of craters with respect to grain boundaries

Results
All spots observed and measured
Worm like features visible only in the small spots (2 – 6 ) with the inlens detector
# Sample parameters

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<th>spot z</th>
<th>meas. Type</th>
<th>Tot. # sparks</th>
<th>Initial beta</th>
<th>Last beta</th>
<th>Gap measurement (Final distance confirmation)</th>
<th>measurement Term</th>
<th>Pressu re</th>
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Shown here after
Worm like features