NTNU
Noregs teknisk-naturvitskaplege universitet

Fakultet for naturvitenskap og teknologi
Institutt for Materialteknologi

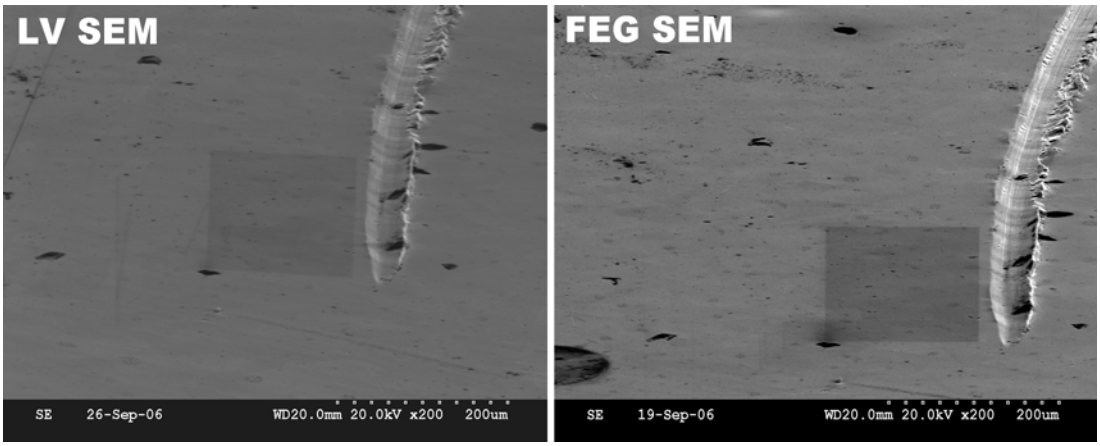
Yingda Yu,
Phone: +47-7359-4863
Fax: +47-7355-0203
E-mail: yingda.yu@material.ntnu.no

Gløshaugen
7491 Trondheim Norway

October 4, 2006

Testing Report of the EBSD detector at the LV SEM (Hitachi S-3500SE) with INCA Programme

EBSD detector testing at the LV SEM is designed by using a pure aluminium sample, and the same EBSD scan is also carried out at the Hitachi FEG SEM. The EBSD mapping from the new detector would then be compared with that from the FEG SEM which uses a well established TSL EBSD programme, to confirm the new detector and INCA EBSD programmer validities.

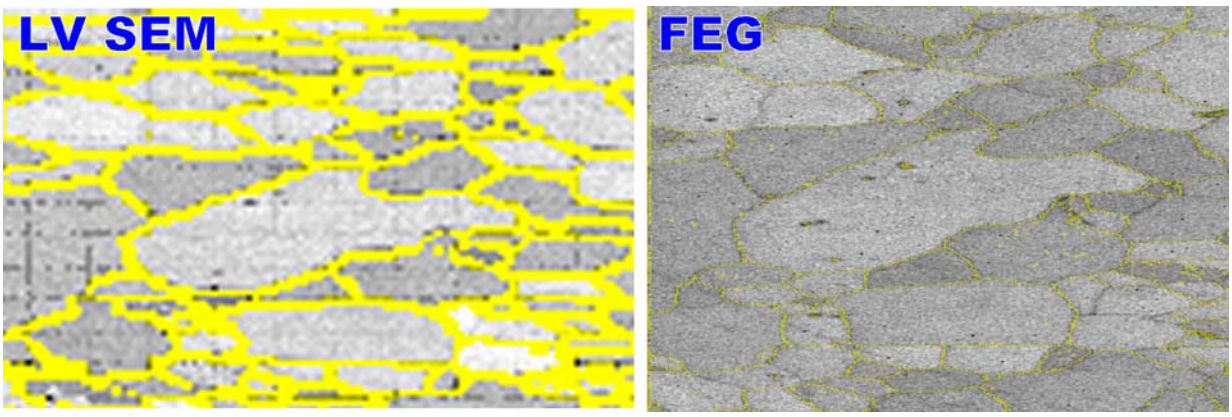


The same EBSD scanned region from the LV SEM and FEG SEM is shown in the above figure, and the SEM conditions as HT 20kV, WD 20.0mm, Mag 200 x and 70 tilting angle.

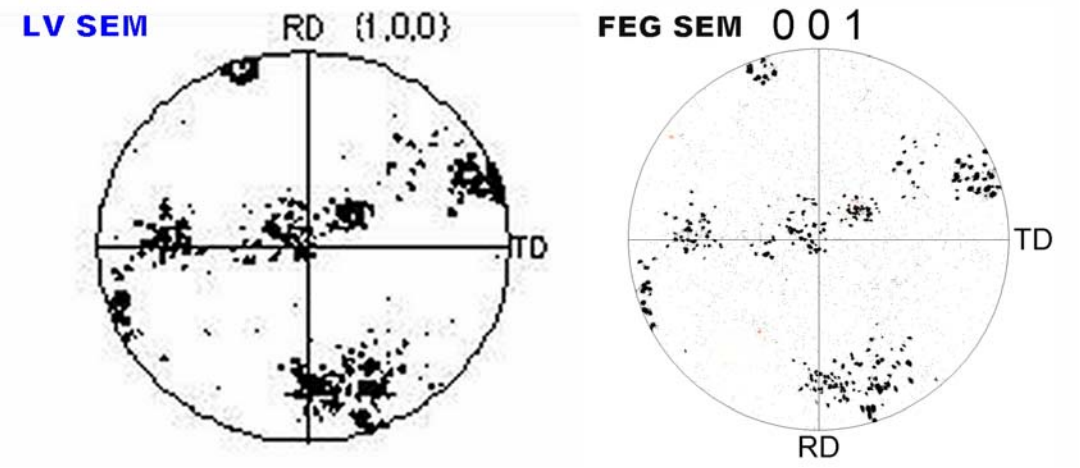
Two basic INCA calibrations for the EBSD patterns were carried out for optimizing EBSD mapping, and the detailed information is given in the early report at
http://folk.ntnu.no/yingday/NilsYD/EBSDbasic/INCAEBSD/EBSDTestReport1.pdf

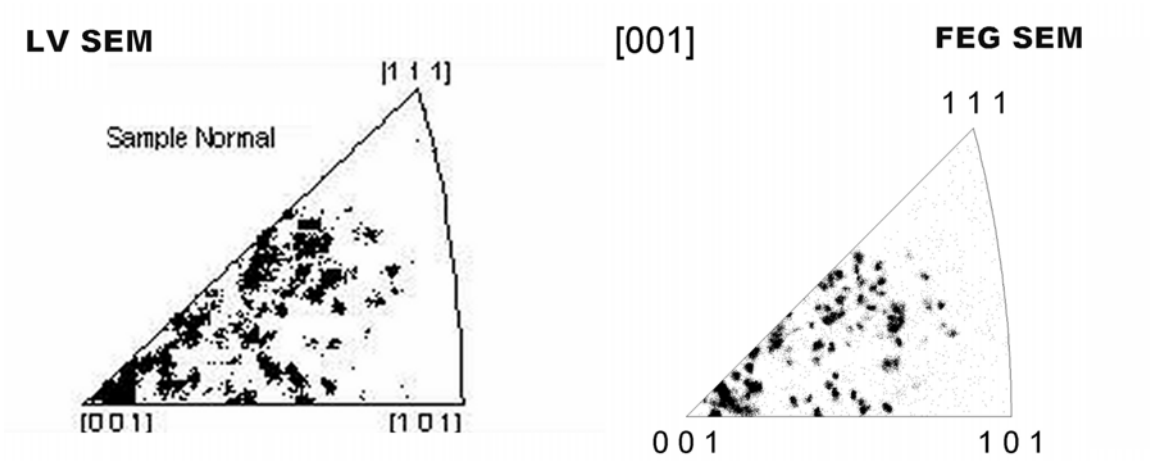
At the present LV SEM setting, the minimum pixel size (1.581 um^2 at the LV SEM 200x) was used in the EBSD mapping for achieving best system spatial resolution (at higher LV SEM magnification, this resolution could be improved). The summary after the EBSD scanning is copied in the below table, which shows a quite good indexing result as 99.2% identified.

```
Key          Phase              %      Detail

Yellow       Aluminum           99.2   Cubic, PRIM

Site area: 285009.858 um2

EBSD pixel size: 1.581 um2
EBSD total pixels acquired: 15352
EBSD acquired area: 24277.962 um2

Selected Phase for Orientation Maps is Aluminum
```



The grain boundary (GB) analysis was carried out for the same EBSD scanned areas both from the Hitachi LV SEM (using INCA analysis programme) and FEG SEM (using TSL). As shown in the above figure, the identical EBSD analysis parameters were used for detecting GB misorientation between 5 – 60 degree in the both GB analysis. These two EBSD analysis results are quite identical which confirms the new EBSD detector and INCA EBSD programmer on the LV SEM validities. Clearly at the magnification of 200, the FEG SEM gives a better resolution with sharp GBs. The further comparison of the pole figure (PF) and inverse PF are shown in below figures.





Summary Remarks: The identical EBSD results are achieved from both INCA and TSL EBSD analysis. Combining the benefit from the LV SEM, the large size samples could be performed EBSD analysis easily, which would be easy for the initial EBSD analysis. Meanwhile, the INCA background division gives a better EBSD view than that of TSL as shown in the early report (*EBSDTestReport1.pdf)* The detailed INCA EBSD resource is give at, *http://folk.ntnu.no/yingday/NilsYD/EBSDbasic/INCAEBSD/EBSDINCAResource.pdf*