

Sample Results Summary Sheet

Please return this form to the Curator for each allocated Sample

Sample ID: RA-QD02-0120-03, 04

PI: Hikaru Yabuta

Type and date of analysis performed:

RA-QD02-0120-03, 04 : STXM analysis (Dec 6-9, 2013) at beam line 5.3.2.2. Advanced Light Source, Lawrence Berkeley National Laboratory

Elements or phases identified: (Mg, Si, olivine, pyroxene, aromatic carbon, etc.)

C, N, O, Ca

Contaminant phases identified: (Al, SUS, carbon particles, etc.)

N/A

Sample handling: (e.g. exposed in atmosphere, embedded in resin, polished, sliced by FIB or UMT)

The FIB section of 100 nm thickness that was attached to the Omniprobe grid (by Uesugi), was attached to the sample plate for STXM

State of sample pre-analysis: (e.g. N₂ hold, atmosphere, resin embedded, polished section, UTS) (please describe treatments and/or modifications for the sample you have done before your analysis)

The samples were pressed on Au plate and sectioned using FIB (by Uesugi)

RA-QD02-0120-03 was analyzed by TEM prior to STXM.

State of sample post-analysis:

(N₂ hold in sample holder, atmosphere, resin embedded, polished section, UTS)

(partially damaged by electron beam, spotted by Ga beam, neutron activation)

(consumed by laser ablation)

(unexpected breakup, into # pieces)

(Lost : reason)

Preserved under atmosphere

Analysis data Notes: (summary of the attached analysis data and/or images)

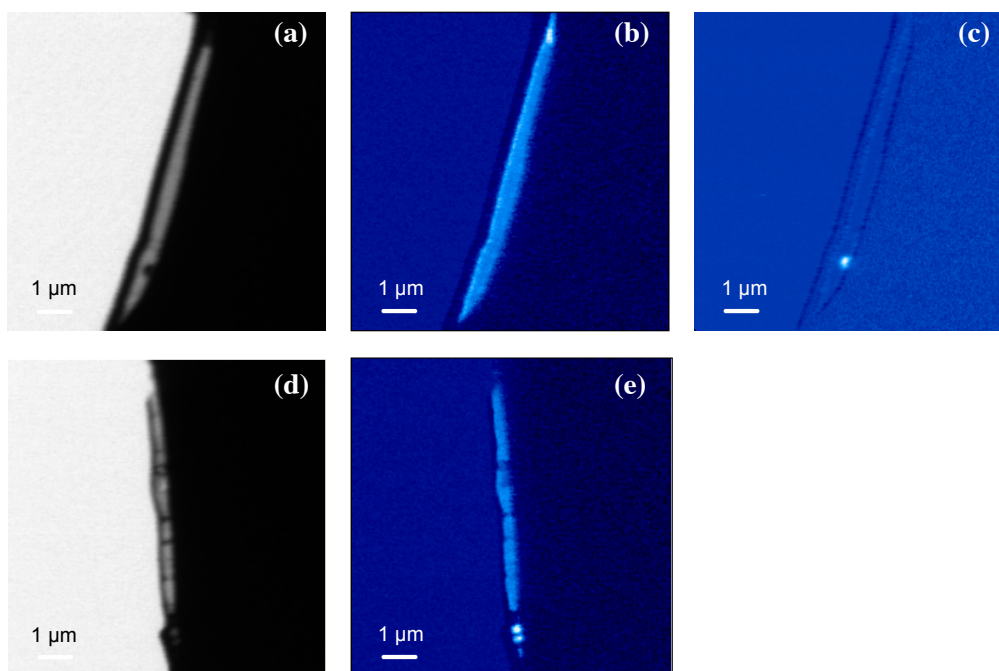


Fig. 1. (a, d) Scanning transmission x-ray microscope (STXM) images, (b, e) carbon and (c) calcium maps for RA-QD02-0120-03 (after TEM, upper images) and RA-QD02-0120-04 (before TEM, lower images), respectively.

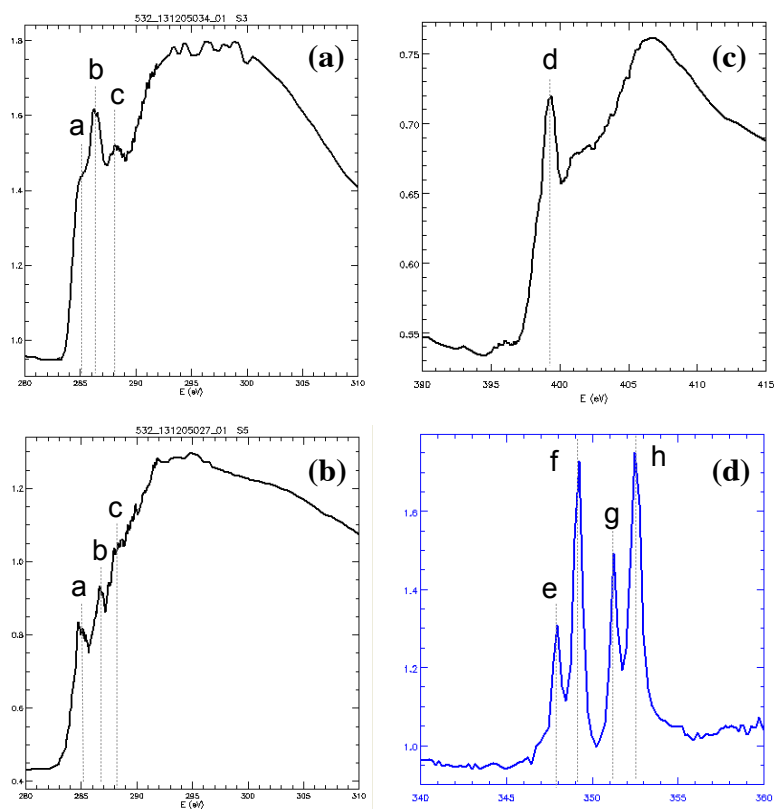


Fig. 2. (a, b) C-XANES spectra for RA-QD02-0120-03 (after TEM, upper image) and RA-QD02-0120-04 (before TEM, lower image), respectively. (c) N- and (d) Ca-XANES spectra for RA-QD02-0120-03 (after TEM). Peak a corresponds to $1s-\pi^*$ transition of aromatic/olefinic carbon ($C=C$) at 285.1 eV; Peak b corresponds to $1s-\pi^*$ transition of vinyl-keto ($C=C-C=O$), nitrile ($C\equiv N$), and/or nitrogen heterocycles ($C-N=C$) at 286.7 eV; Peak c corresponds to $1s-\pi^*$ transition of carboxyl carbon ($COOH$) at 288.2 eV; Peak d at 399.3 eV could be shifted from $1s-\pi^*$ transitions of imine ($C=N$) at 398.9 eV and nitrogen heterocycles ($C-N=C$) and/or nitrile ($C\equiv N$) at 399.7 eV due to electron beam of TEM; Peaks f and h at 349.2 and 352.5 eV are assigned to the L_3 and L_2 edges of Ca, respectively. Peaks e and g at 347.9 and 351.2 eV are the coordination peaks of peaks f and h.