Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SCG090-02 Room: 304 Time: May 25 13:57-14:10

Laser Raman spectroscopic analysis of fluid inclusions along fault zones

Kazuna Fujita[1*], Kiyokazu OOHASHI[1], Tom Mitchell[2], Dan Faulkner[3], Kenichi Hoshino[1]

[1]Hiroshima University, [2]Ruhr University Bochum, [3]Liverpool University, UK

Although fault zones have been conceived as fluid pathway, the analysis of the chemical composition of fluids in these zones have recieved less attention. Faulkner et al. (2006) reported that the density of microfractures shown as fluid inclusion planes (FIPs) in host rocks of the Caleta Coloso fault in the Atacama fault system of northern Chile increases toward the fault core. These microfractures are interpreted to have formed during faulting and healed by mineral precipitation from fluids passing through the fractures. Hence, it is expected that the fluids have been preserved as the fluid inclusions in FIPs.
We have measured orientations of FIPs and analyzed chemical compositions of fluid inclusions in FIPs observed in host rocks along the Caleta Coloso fault and the Atera fault area in Gifu Prefecture, central Japan. Samples analyzed in the present study for the Atera area were collected from the Naegi-Agematsu granite of Cretaceous age occurring close to the outcrop described by Niwa et al. (2009) and surrounding areas. Quantitative and qualitative analyses of salinity and gas components, respectively, were carried out by laser Raman spectroscopy. SEM-CL (Cathodoluminescence) was also used to confirm FIPs.
Orientations of FIPs observed in the sample collected from 20 m west of the fault core of the Caleta Coloso fault distribute mostly around the Y and P planes and between T and X planes of the fault, while those in the sample from 40 m west of the core are distributed around the P plane. Measured salinities of the fluid inclusions are 0 - 20.5 wt. % (NaCl eq.). CO2 was detected in vapor phases of some inclusions in the both samples. At 140 m west of the core, FIPs are orientated almost randomly in the sample. Fluid inclusions in the FIPs show salinities of the inclusions as 6.8 - 23.9 wt. % with no gas component.
FIPs in weakly brecciated granite collected from 15 m east of the Atera fault orientates mostly along R1 plane of the fault, while FIPs in the sample from 100 m east of the fault are oriented around the T and P planes. Salinities of the fluid inclusions are as low as 0 - 3.7 wt. %. H2, CH4 and N2 were detected in vapor phases in the inclusions. Although salinities are low (0 - 3.6 wt. %), those gas components could not be observed in the sample collected from 400 m east of the fault in which FIPs orientate mostly along Y and T planes.
In summary, FIPs in the host rocks close to the faults tend to orientate along the shear planes. It is also characteristics that gas-bearing fluid inclusions were observed in FIPs close to the fault core, whereas they are not detected in fluid inclusions in a background FIPs far from fault cores. Gas compositions of vapor phases in fluid inclusions along the Atera fault may represent reduced conditions of the fault fluids.

Keywords: fluid inclusion, fluid inclusion plane (FIP), fault, Raman