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Shenxigou 地域の龍門山断層帯における炭質物のラマン分光分析
Raman spectroscopic analysis of carbonaceous material in Longmenshan fault zone at Shenxigou

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On 12th May 2008, Wenchuan M_W 7.9 earthquake occurred along the Longmenshan thrust belt between the Tibetan plateau and the Sichuan basin. Shenxigou area is located at the western end of the coseismic faults during the Wenchuan earthquake. The fault zone consists of fault gouge, fine fault breccia, and fault breccia. The gouge zone consists of grayish gouge (GG) and blackish gouge (BG). The breccia zone consists of grayish breccia (GB), blackish breccia (BB), and mixtures (Mix) of GB and BB. The concentrations of organic carbon are reported as less than 1 wt.% in GG and GB, while those in BG and BB are 28 and 36 wt.%, respectively (Wang et al. 2014; Earthquake Science) . In the present study, we performed the Raman spectroscopic analysis of carbonaceous material (CM) included in these fault rocks and host sedimentary rocks. In addition to the natural samples, we also analyzed the gouge samples after high-velocity frictional experiment to detect the structural change of CM by frictional heating.

Raman spectroscopic analysis was carried out using 532 nm Nd-YAG laser. The laser power was limited to 0.2 mW to avoid the damage to CM. The CM Raman spectrum was fitted using four peaks (D1, D2, D3, and D4 bands) following the method of Kouketsu et al. (2014; Island Arc). The Raman spectra of CM in GG, BG, GB, BB, and Mix were similar , and all Raman spectra indicated that the structure of CM corresponds to amorphous carbon. This result suggests that the carbons were originated from the organic materials in the host rocks and not concentrated by hydrothermal precipitation. The Raman band width (full width at half maximum; FWHM) of these fault rocks was larger than that of the host rock, and it means that the degree of coalification of CM in the fault rock is lower than the host rock. The estimated metamorphic temperatures using Raman CM geothermometer proposed by Kouketsu et al. (2014) are around 200-230 ℃ in the fault rocks and 280-300 ℃ in the host rock. The Raman spectra of CM in the sample conducted on the frictional experiment that was carried out at constant slip rate of 1.4 m/s and normal stresses 0.8 MPa under room humidity conditions using BG also showed no obvious change compare to those of CM before the experiment. In the present study, frictional heating was not detected by the Raman spectroscopy in natural and experimental fault samples. These results indicate that the heating duration of the coseismic slip was insufficient for the studied CM to maturate enough.

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