

Pseudotachylyte from the Hatagawa Fault Zone, northeast Japan

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Several blocks of pseudotachylytes, cohesive glassy or very fine-grained rocks, crop out in the Hatagawa Fault Zone (HFZ) at the eastern margin of the Abukuma Mountains, NE Japan. Structurally the HFZ is subdivided into three zones: sinistral sheared mylonite, cataclasite and small-scale shear zones (Tomita et al., 2002), with NNW-SSE regional trend. As pseudotachylyte bears a special relationship with the seismic slip events, recently been described, the occurrence, microstructure and deformation style have been great deal to seismologist and structural geologist in Japan to know the earthquake nucleation process and tectonic history of the HFZ.

Samples for the present study were collected from mylonite zone at Hirusone along the Ukedo River in Namie town. Mylonite rocks are partly cataclasites with quartz porphyry dikes. Injection veins and amorphous materials were observed through naked eyes, and with the help of polarizing microscope and TEM. Microstructure, chemical composition and temperature estimated data were obtained through polarizing microscope, SEM, TEM, XRD, XRF, EDS and EPMA analysis. Results showed that pseudotachylytes are characterized by the presence of spherulites, sheath-fold and stringy textures with high porosity. These features demonstrate the frictional melting due to high-speed sliding. Chemical compositions of pseudotachylytes differ from those of the host rocks. In addition, chemical analysis and temperature estimated data subdivided the rocks into two groups as follows; K-enriched pseudotachylyte with cataclasite structure having 1 cm width formed at high temperature ranging from 1150 to 1730°C, and Mg, Fe-enriched pseudotachylyte with mylonite of less than 1 mm width formed at low temperature from 1000 to 1695°C. Alternation of brittle failure and ductile deformation present in pseudotachylytes revealed that the area of study was experienced brittle-plastic transition of condition of deformation. Overprinting relations between other pseudotachylytes proved that frequent earthquakes happened in this area.