



## **Microstructural and magnetic investigations of pseudotachylyte and ultracataclasite in the Hoping River, Tananao Complex, Eastern Taiwan**

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Here we investigate seismic rupture processes through the microstructural and magnetic study of pseudotachylyte and ultracataclasite from the Hoping River area. Unlike other fault rocks, pseudotachylytes form through friction-related melting during an earthquake. Therefore, these rocks, regarded as earthquake fossils potentially hold valuable information on seismic deformation. Paradoxically, although Taiwan is a seismically active zone, reports of pseudotachylyte outcrops in Taiwan remain rare. Previous studies reported the first pseudotachylyte outcrop in the Hoping River from which the magnitude, direction and sense of seismic slip were subsequently determined. In this study, we apply new microstructural and magnetic approaches to investigate the pseudotachylyte veins.

X-ray fluorescence (XRF) geochemical analyses show that the pseudotachylyte melt, formed by incongruent melting, is depleted in  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Na}_2\text{O}$  and enriched in  $\text{Fe}_2\text{O}_3$ ,  $\text{K}_2\text{O}$  compared with the ultracataclasite and host rock. This observation suggests selective melting of biotite. Scanning electron microscopy (SEM) and transmission X-ray microscopy (TXM) supports the melt origin of the pseudotachylyte although melting occurred only in small spots, manifested by a few microcrystalline aggregates, with low melt percentage ( $\approx 10\%$ ). Small iron-oxide grains are discovered under TXM, which may be formed by the breakdown of biotite in the host rock during melting. The presence of iron oxide grains appears restricted to the pseudotachylyte.

Since the iron content of the pseudotachylyte is slightly higher (4 wt. %) than the ultracataclasite and granitic host rock, magnetic hysteresis measurements were performed under high field (up to 1 Tesla) using a vibrating sample magnetometer (VSM) to determine the nature of ferromagnetic minerals. Magnetic hysteresis curves show the pseudotachylyte veins of the Hoping River are dominated by paramagnetic phases, with a very weak saturation isothermal remanent magnetization. Magnetite concentration, inferred from these measurements, is on the order of a few ppm only.