Goethite Observation within Chelungpu Fault Zone of TCDP Hole-B

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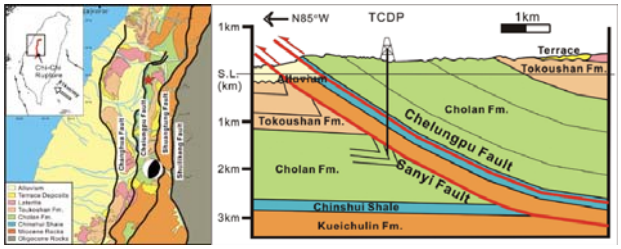
The 1999 Chi-Chi earthquake (Mw 7.7) struck central Taiwan and produced 8~10 meters uplift at or near the surface. This is an infrequent opportunity for coring and sampling an attainable fault that had large slip in a recent earthquake. Taiwan Chelungpu-fault Drilling Project (TCDP) drilled two vertical holes 40 m apart (hole A to a depth of 2 km, and hole B to a depth of 1.3 km), near the town of DaKeng, central Taiwan (Fig. 1), affords us precious fault samples for seismic research. The internal structure of fault gouge is still unknown. The transmission X-ray microscope has high resolution and the capability of 3D tomography, is an adaptive tool for this study.



(A) (B)

Fig. 1: Geological map and cross-section near the drill site. (A) Geological map displays the formation disturbution and major faults in the central Taiwan. The TCDP site is indicated by a red star. (B) Cross section though the drill site shows the relation between formations and major faults. (Modified from Yeh *et al.*, 2007)

The fluids are thought to have an important role in faulting and the dynamic propagation of earthquake rapture. The aqueous minerals are the main index of fluid information within fault zone. From the results of magnetic parameters and TEM, we found that goethite (α-FeOOH) is the dominant magnetic mineral within the gouge zone of Chelungpu fault (Fig. 2). The new evidences show that goethite formed in post-seismic period. In this study, we used TXM to observe the distribution and morphology of goethite within fault gouge zone (Fig. 3). The existence of goethite can help us to speculate the chemical and heating process during Chelungpu-fault slipping.

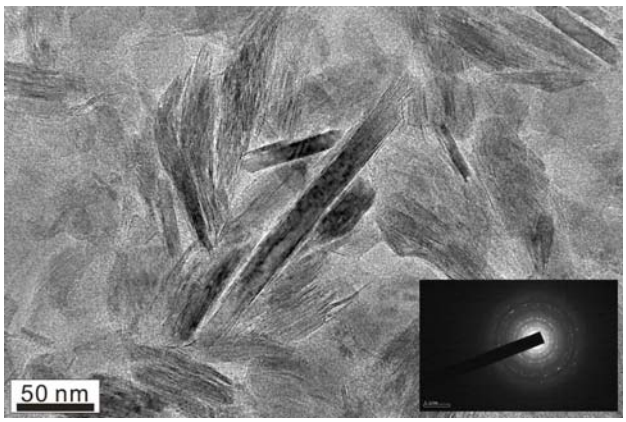


Fig. 2: The TEM photo and electron diffraction of goethite (α-FeOOH) within black gouge of FZB1136.

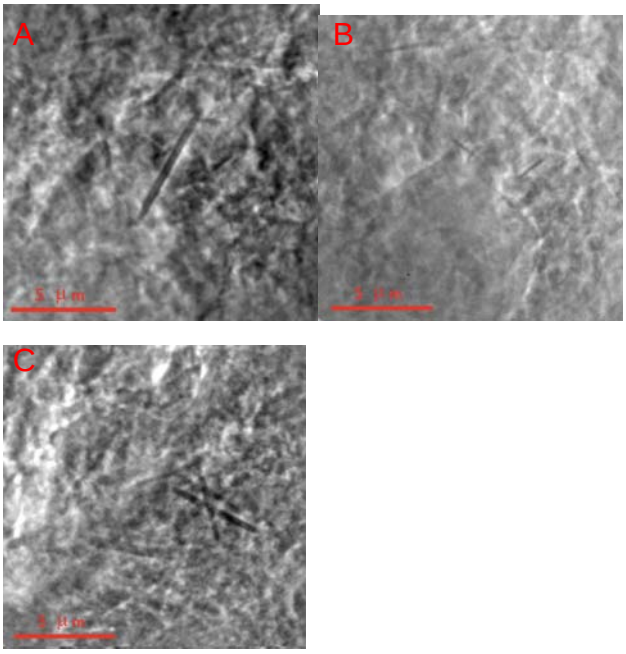


Fig. 3: TXM photo of goethite within TCDP Hole-B fault gouge zones. (A) & (B): FZB1194 black material disk. (C): FZB1136 black gouge.