# Chemical reaction during an earthquake at the Taiwan Chelungpu fault

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The Chelungpu fault, which trends north to south over a distance of approximately 100 km at the ground surface, slipped during the 1999 Chi-Chi earthquake (Mw 7.6) [Ma et al., 1999]. The Taiwan Chelungpu-fault Drilling Project (TCDP) drilled three holes penetrating the Chelungpu fault and recovered rock samples from three prominent fault zones discovered [Ma et al., 2006; Hirono et al., 2006]. The shallowest fault zone was most likely the one that slipped during the Chi-Chi earthquake, because recent heating and a major stress-orientation anomaly were observed in that zone [Kano et al., 2006; Wu et al., 2007]. This fault zone, sampled from the second hole (Hole B), consists of a fracture-damaged zone, a breccia zone, a gray fault gouge, and a black fault gouge [Hirono et al., 2006; 2007a]. In the black gouge zone, a 2-cm-thick slip zone is associated with the Chi-Chi earthquake [Ma et al., 2006; Hirono et al., 2008b]. This zone is relatively low in inorganic carbon (mainly calcite), smectite, and kaolinite contents, compared with the surrounding zones, and the magnetic susceptibility is relatively high [Ikehara et al., 2007; Hirono et al., 2006; 2008a]. These values have been attributed to frictional heat-induced chemical reactions, including thermal decomposition of calcite, dehydration of interlayer water and dehydroxylation of smectite, dehydroxylation of kaolinite, and the production of magnetite from thermally decomposed paramagnetic minerals such as siderite [Ikehara et al., 2007; Hirono et al., 2008a; Mishima et al., in press]. Because these reactions are endothermic, heats of reaction take up energy released from the fault during the Chi-Chi earthquake reducing other forms of energy. In this presentation, we will talk about the detail of the chemical reactions that occurred during an earthquake and effect of heat loss by the reactions.