

Dehydroxylation kinetics of clay minerals and its application to friction heating along an imbricate thrust in an accretionary prism

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Dehydroxylation of clay minerals within fault gouges is significant for assessing transient thermogenesis due to high-velocity, frictional slip along fault zones. The clay minerals kaolinite and chlorite are common in fault zones hosted in sedimentary rocks at subduction margins. To better understand the dehydroxylation processes of these clay minerals, high-temperature X-ray diffraction (XRD) analyses were carried out by using a 1:1 mixture of kaolinite and chlorite standard samples. We evaluated the kinetic parameters of each dehydroxylation reaction by thermogravimetric analysis. Thermal models of frictional heating employing this calibration show that the frictional heating can explain the reported clay mineralogy in a fossil imbricate thrust from a shallow part in an ancient accretionary prism (Shirako Fault, Japan). This result supports the previous assertion, and the observed temperature anomaly appears to demonstrate the frictional heating caused by coseismic slip on this fault.