Vitrinite reflectance analysis for thrust fault in subduction zone

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The vitrinite reflectance is one of the most sensitive geo-thermometer for sedimentary rock, and applying for studying thermal maturity in sedimentary basin. The value of vitrinite reflectance will increase with depth, and some offset will be found in subduction zone. The hanging-wall block of a reverse fault thrusts from deep, and offset of the vitrinite reflectance between the hanging wall and footwall may accumulate with repeated faulting. This method can find the fault much larger activity than the other faults in accretionary complex (Sakaguchi, 1996; Ohmori et al., 1997; Kondo et al., 2005; Mukoyoshi et al., 2006).

The vitrinite reflectance can detect frictional heat along the fault in accretionary complex by new method which we show. The ordinal method described in International Organization for Standardization (ISO), Japan Industrial Standard (JIS) and American Society for Testing and Materials (ASTM) were made in coal mine, therefore, it is considered for large coal grains bigger than 75 micron meters (# 200 in mesh size). This paper provides new method for small vitrinite grain within fault zone. In the previous method, sedimentary rock including coal fragments are crashed at least 1 mm in size, and divided coal fragments from other mineral grains were polished its surface after mounted by resin. The vitrinite is classified under microscope from other coal components of charcoal-like inertinite by vascular texture. The vitrinite has a homogeneous texture due to gelatinization of the coal during diagenesis.

We made polished rock slab without crashing to keep occurrence of the core sample in the Chelungpu fault zone, Taiwan. Some coals have injection structure penetrating the pore between the surrounding sand grains. The homogeneous texture and injection structures are characteristic occurrence in vitrinite, and they may result in thermo-plasticity. Whereas these occurrences are unusual in inertinite. It is therefore indistinguishable in small fragments on a scale smaller than plant tissue. The ordinary method cannot distinguish between the distribution of vitrinite reflectance and the deformation structure of faults due to crushed bulk rock sample. Additionally, the fragments within the fault zone underwent grain-size reduction making them too small for petro-graphic classification.

Reflection microscope illuminates visibility field much wider than center analyzing spot, and some mineral grains of pyrite, calcite and others have extra higher reflection than vitrinite. Diffused light from high reflection grain makes noise for vitrinite reflectance analysis. We limited illumination area; however excessive small aperture causes increase of background noise due to strong diffracting by normal light. Modified microscope with small illuminated area of 400 square micron meters, much smaller than previous one of 2500 to 10000 square micron meters, succeeded to find high reflectance zone of vitrinite around shear zone of the Chelungpu fault.