

# **Application of Luminescence Dating Methods on Quaternary Geological Materials in southwestern Taiwan**

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## **Abstract**

Luminescence dating laboratory at National Taiwan University (NTU) was established in 1993, and we had processed hundreds of samples to comprehend the luminescence characteristics of local materials. The luminescence facilities set up in NTU contains one Littlemore 7188 and two Risø TL/OSL readers with one single grain attachment. The annual dose is calculated from the concentrations of radiogenic nuclides in sediments based on XRF and ICPMS, and several samples are undertaken with high resolution gamma spectrometry to compare with.

The deposited age of sediments are widely claimed for investigations on paleoclimatology, paleoenvironment, and neotectonic. The luminescence dating technique allows us determine the ages of sediments and potteries from the past a few years up to ca. 500ka; however, samples from different areas come out different luminescence behaviors. The suitable procedure to undertake Quaternary geological materials in southwestern Taiwan has been made an attempt for 6 years. We are involved in the project 'Earthquake Geologic Investigation and Data Bank Compilation on Active Faults in Taiwan' and consequently provide luminescence ages.

Borehole samples in southwestern coastal plain have given a primary successful application that quartz from drilled cores is sensitive with bright optically stimulated luminescence (OSL) signals. Therefore, we collected samples from two boreholes and uplifted alluvial fans in the field for determination of depositional ages using luminescence dating to investigate the long-term slip of the Chiuchungkeng Fault. In Taiwan, the occasion of heavy rainfall and rapid movement of tectonic leads to insufficient bleaching on the OSL signal and causes an age overestimation. The high residual signals were found from modern fluvial deposits which are supposed to give a zero value theoretically. For the purpose of reducing the unbleached effects we applied less grain numbers to separate the well bleaching portion and to improve the

burial age of younger samples. One trenching site and other terraces samples were applied to compute the long-term slip rate of Chelungpu fault. Borehole samples mentioned above were taken again to approach the upper limitation of luminescence dating of quartz. Based on the reconstructed growth curve, a large saturation value are found, hence multiple luminescence dating methods were conducted to establish a continuous geological time frame.

We now have confidence in luminescence dating methods to provide reliable depositional ages on the basis of samples with well studied geological background. Single grains of quartz and K-feldspar will be undertaken later to improve our understanding on geology and physics.