J250-P001 **Room: Poster Session Hall** **Time: May 25**

ESR dating: the principle, the applications, and the issues

Shin Toyoda[1]

[1] Dept. Appl. Phys., Okayama Univ. Sci.

ESR (electron spin resonance) is a method of physics which detects unpaired electrons in materials. The dating method was proposed based on the fact that unpaired electrons are created by natural radiation and are accumulated in the minerals in the geological time scale.

ESR ages are calculated by dividing the natural accumulated dose, which is obtained by ESR measurements, by the natural dose rate (the radiation dose given to the mineral per year). As the number of unpaired electrons created by unit radiation dose depends on sample to sample, additive dose method is generally applied; we examine the rate by applying the gamma ray dose to enhance the ESR signals, and extrapolate the dose response line (or curve) to the zero ordinate to obtain the accumulated radiation dose. The natural radiation given to the samples is from U, Th and K in the sample and in the surrounding soil, and the cosmic dose. The amounts of the above radioactive elements are obtained by chemical analysis, neutron activation analysis, or by low background gamma ray spectroscopy. A conversion table is available to calculate the doses from these concentrations. Corrections are made for grain size of the sample and for water content. The estimation of the cosmic dose is also possible with a literature.

ESR dating method was first successfully applied to spleothems in Akiyoshi Cave (Ikeya, 1975). Calsium carbonate was found next to be suiable for the dating method, such as corals and shells of calcite and aragonite. The enamel of human and animal teeth, quartz, and gypsum were also found to be suitable. The ESR ages of corals were found to be consistent with C ages and U series ages, showing the confidence of this method. The ESR ages of tooth enamel gave very important contributions to the studies of human evolution and its migration. However, the applications of ESR dating to quartz are not so much popular, although quartz is one of the most abundant minerals in the Earth's surface and therefore many applications such as faulting, tephra, volcanic rocks, flints (stone implements), fluvial, aeolian and marine sediments, probably because the formation and decay of the paramagnetic defects quartz is complex than other ESR signals. In the presentation, these problems will be reviewed, together with the new applications of the ESR signals in quartz as proxies of meterial transportation on the Earth's surface.