

Thermoluminescence Study of Japanese Antarctic Ordinary Chondrites

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Introduction

Induced TL (thermoluminescence), the response of a luminescent phosphor to a laboratory dose of radiation, reflects the mineralogy and structure of the phosphor, and provides valuable information on the metamorphic and thermal history of meteorites. The sensitivity of the induced TL is used to determine petrologic type of type 3 ordinary chondrites [1, 2].

Natural TL, the luminescence of a sample that has received no irradiation in the laboratory, reflects the thermal history of the meteorite in space and on Earth. Natural TL data thus provide insights into such topics as the orbits of meteoroids, the effects of shock heating, and the terrestrial history of meteorites. Then natural TL is usually applied to pairing. As reliable pairing approach, TL properties within large chondrites were analyzed, taking advantage of the fact that a serial samples from large meteorites are known to be paired [3]. Then a set of TL pairing criteria: 1) the natural TL peak height ratios, LT/HT, should be within 20%; 2) that ratios of raw natural TL signal to induced TL signal should be within 50%; 3) the TL peak temperatures should be within 20 and peak widths within 10 was proposed. This set of TL pairing criteria is less restrictive than previously used [3].

National Institute of Polar Research (NIPR) takes 16,201 meteorites from Antarctica so far [4]. 2000 meteorites or more were collected from dirt bands south of the Sør Rondane Mountains as shown in Fig.1. In them, the TL properties of 129 Asuka type 3 ordinary chondrites in the Japanese Antarctic meteorite collection have been measured.

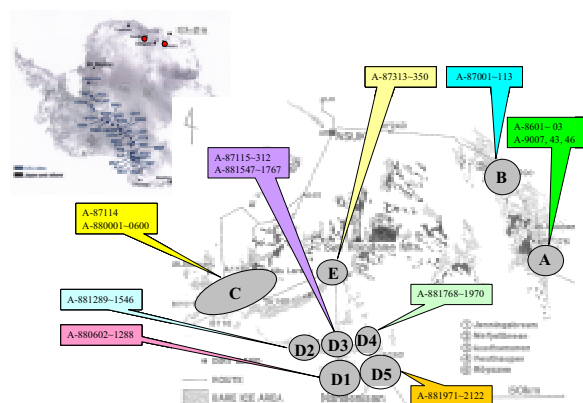


Fig. 1 Asuka Sampling Sites

Subtype

The petrologic subtype was determined from their TL sensitivity. Eighteen chondrites, A-881607, A-881328, A-881408, A-881244, A-87319, A-9043, A-881125, A-881096, A-881090, A-881399, A-881088, A-881494, A-881283, A-881258, A-881026, A-881083, A-881558, and A-881236 had low TL sensitivities corresponding to subtype 3.2 or less. However olivine heterogeneities of A-881125, A-881096, A-881090, A-881399, A-881088, A-881494, A-881283, A-881258, A-881026, A-881083, A-881558, and A-881236 were below 50%. These chondrites would be received heavy shock or heavy weathering. Then remained six chondrites, A-881607, A-881328, A-881408, A-881244, A-87319, A-9043 are really primitive chondrites.

Pairing

22 fragments of 7 groups satisfy the TL pairing criteria. A group of H3 at D1 site comprises a chain of paired fragments. An H3 chondrite might shower near the Asuka.

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