

REGOLITH HISTORY ON THE AUBRITE PARENT BODY.

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Introduction: Some characteristics of the aubrites are long cosmic-ray irradiation records and heterogeneous chemical compositions. Large isotopic shifts of Sm and Gd related to neutron capture reactions were found in aubrites [1], which suggested near-surface irradiation history of aubrites on the parent body. Recent noble gas isotopic studies of aubrites reveal also regolith processes on their parent body [2]. In particular, the large variations in cosmic-ray-produced ²¹Ne_c concentrations in the small Pesyanoe mass (3.4 kg) between light and dark phases [3] are inconsistent with shielding effects during space irradiation. The discrepancies in exposure ages for two samples [2] make the Pesyanoe meteorite suitable for studies of the regolith history. We present here new Sm and Gd isotopic data of aubrites including Pesyanoe to investigate the regolith history of their parent body.

Samples: Six samples from two different Pesyanoe fragments (PES-90 and PES-92), three from Pena Blanca Spring (PBS), one from Norton County (NC), Shallowater (SW), and Khor Temiki (KT) were used in this study.

Results and Discussions: The calculated neutron fluences for all six Pesyanoe samples are very large (2.2 to 2.9x10¹⁶ n cm⁻²) and variable. The variations observed in the neutron fluences are due to the irradiation history in the regolith. Only minor differences are expected during space irradiation due to shielding depths and variation of the chemical compositions.

Figure 1 shows a plot of neutron fluences vs. CRE ages of aubrite samples. The data from our early study [1] are also plotted in the figure. There is apparently no correlation between the neutron fluences and CRE ages. However, the data suggest the subdivision of aubrites into subgroups with only space irradiation (Mt. E, SW, PBS, NC, MB) and a subgroup with regolith history (ALH, PES, BV, CF).

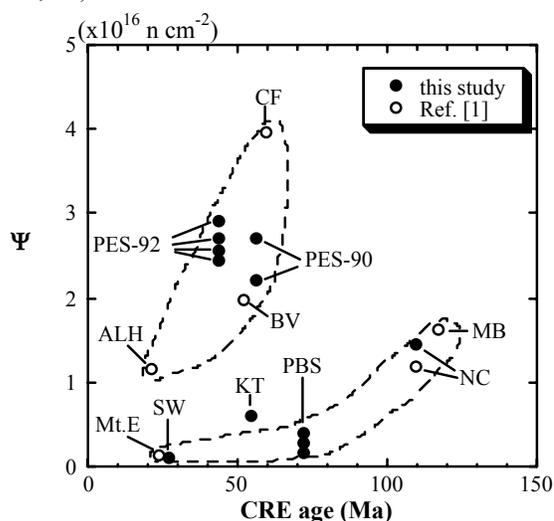


FIG. 1 A plot of neutron fluences vs. CRE ages of aubrites. ALH: ALH78113, BV: Bishopville, CF: Cumberland Falls, MB: Mayo Belwa, Mt.E: Mt. Egerton. The CRE ages are cited from [2].

References: [1] Hidaka H. et al. (1999) *EPSL*, 173, 41–51. [2] Lorenzetti S. et al. (2003) *GCA*, 67, 557–571. [3] Müller O. and Zähringer J. (1966) *EPSL*, 1, 25–29.