

Development of an in-situ dating package for lunar/Mars missions

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Age data of geologic records on the Moon and Mars will significantly improve our understanding of their evolution. We have been developing an in-situ K-Ar dating instrument and conducted a series of experiments to demonstrate its principle. In this presentation, we report the recent progress in the engineering aspect of our instrument.

First, we have established the design of our instrument package and the procedure of age measurements. Second, we have designed a sample handling system using parallel link motion. Third, we conducted blank measurements using the noble-gas analysis system we built previously, in order to investigate the capability of O-rings as seal materials. We used Viton and Nexus-SLT O-rings instead of metal gaskets. Our results indicate that a metal seal can be replaced with sufficiently baked Viton O-rings in the lunar environment because there is no atmosphere permeating through the O-ring. Our experimental results also indicate that under the pressure of Martian atmosphere (i.e., 6 hPa), a sufficiently low blank level can be achieved by using a double O-ring evacuating system. Above-described developments enhance the technical feasibility of our in-situ geochronology instrument.