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Release of Argon from Activated Rocks and Powders

Neutron activation products, such as Ar-37 and Ar-39, comprise an important component of the radionuclide signature from an underground nuclear explosion (UNE). While the production of activation products from a UNE can be predicted based on relevant cross-sections and geologic composition, uncertainty still remains as to what fraction of the activation products are released from the geologic matrix into air-filled pore space – the emanation fraction. A system was developed at Pacific Northwest National Laboratory to quantify the emanation fraction of argon from samples ranging in size from powder to small (multiple centimeter) rocks. To date, seven materials, two powders and five rock types, have been irradiated with neutrons and the emanation fraction of Ar-37 been measured. Additionally, the emanation of Ar-39 for four of those materials was also measured. These measured emanation fractions of both Ar-37 and Ar-39 will be presented along with a brief description of the system used to measure them.

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