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Techniques for purification and purity analysis of various inorganic materials for the AMoRE

The Advanced Mo based Rare process Experiment (AMoRE) searches for neutrinoless double beta decay of 100Mo in molybdate crystals, such as 40Ca100MoO4, Li2100MoO4 or Na2100Mo2O7. For such a rare event search experiment, the techniques which allow investigation and reduction of radioactive background are extremally crucial. The first step in developing highly radiopure scintillating crystals is deep radio purification of raw materials used for growing them (MoO3 and carbonates of Ca, Li or Na), quantified with precise and accurate radio-assay analysis. For the most important component, MoO3, the purification technique consists of a sequence of vacuum sublimation, co-precipitation, and complete precipitation of Polyammonium Molybdates (PAM) from acidic solution. Produced in such a way, MoO3 contains the Th and U concentrations below 10 pg/g, the detection limit for direct ICP-MS measurement. To reach this sensitivity, an optimized sample preparation method followed by a solid phase extraction technique with UTEVA resin was applied. We will present techniques of radio purification and trace ICP-MS analysis performed at Center for Underground Physics (IBS, Korea) for different inorganic materials.

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