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Preparation of the precursors for AMoRE-II crystals synthesis

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Advanced Mo-based Rare process Experiment (AMoRE) is a series of experiments for the neutrinoless double beta decay of 100Mo using molybdate-based crystals, such as $^{40}Ca^{100}MoO_4$, $Li_2{}^{100}MoO_4$, or $Na_2{}^{100}Mo_2O_7$. AMoRE phase-II aims to reach the internal background level below 5×10^{-6} ckky (count/kg/keV/year) in ROI using ˜200 kg of bolometric crystals, which means levels for radioactive contaminants thorium, uranium, and radium are supposed to be below several μBq/kg. For such a "zero-background"experiment, preparation of the initial materials used for crystal production is crucial. Molybdenum trioxide powder enriched with Mo-100 isotope (>99.6% enrichment, JSC ECP, Russia), $^{40}CaCO_3$ powder depleted in ^{48}Ca (FSUE Electrochimpribor, Russia), lithium and sodium carbonates (99.999% purity grade, off-the-shelf products) are main precursors used for the AMoRE-II crystal synthesis. This work will describe the purification, mass-production, and recycling of those precursors to perform such a high-scale experiment.

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