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Scintillation crystal growth at the Center for Underground Physics

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The Center for Underground Physics (CUP) at the Institute for Basic Science (IBS) has been conducting two major experiments, the COSINE experiment for dark matter search and the AMoRE experiment for neutrinoless double beta decay search. The COSINE experiment is using NaI:Tl scintillation crystals and the AMoRE is studying the 100Mo based scintillation crystals such as CaMoO4 and Li2MoO4. To minimize the internal background from the crystals, both experiments require ultra-pure scintillation crystals grown from highly purified powder.
For the COSINE experiment upgrade with more amount of NaI:Tl crystals, we had set up a small-size grower for an R&D of the crystal growth and a full-size grower for growing large size crystals for the final detectors. We have been growing a few pure NaI crystals and a few Tl doped NaI crystals (NaI:Tl) at the small-size grower and optimizing the growth condition of the NaI:Tl crystals before trying the full-size grower.
For the AMoRE experiment, we grew the CaMoO4 and Li2MoO4 crystals successfully by a Czochralski grower. The Li2MoO4 crystals were grown by using the purified MoO3 powders. We also succeeded in the double-crystallization growth of the Li2MoO4 which was grown by two of single-crystallized Li2MoO4 crystals as raw materials.
Purities of the grown crystals (NaI, CaMoO4, Li2MoO4) were confirmed by ICP-MS measurements and the Li2MoO4 crystals were measured further by a HPGe detector. The XRD patterns of the crystals were also checked with references to confirm the compositions of the grown crystals. In this study, we will present the growths and measurements results of crystals at the CUP.

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