Growth and characterization of ^{6}LiI:Ag crystal scintillators for lunar surface thermal and epithermal neutron detection

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The 1-inch diameter of ^{6}LiI:Ag crystal scintillators are developed for both thermal and epithermal neutron detection for searching lunar surface water by a lunar landed mission with a Vehicle Radiation Dosimeter (LVRAD). The ^{6}LiI:Ag crystals are grown by two zone Bridgman furnace. Grown 1-inch ampoule of ^{6}LiI:Ag crystal is cut with the dimension of 10 mm thick and 25.4 mm diameter and encapsulated since it is hygroscopic. Luminescence and scintillation properties such as X-ray emission spectrum, scintillation light yield, energy resolution and fluorescence decay time. Neutron sources are used to measure neutron energy from ^{6}Li(n, α)^{3}H reaction and it is demonstrated that neutron signals from gamma rays using pulse shape discrimination method. We will show the advantage of ^{6}LiI:Ag thermal neutron detector because of its highest detection efficiency in terms of size, pulse shape discrimination capability and strong radiation hardness among scintillation materials. Developed ^{6}LiI:Ag neutron detector can be used not only for the LVRAD experiment but also for measuring neutrons in very high radiation fields such as long-term space missions, accelerator environments and neutron therapy.

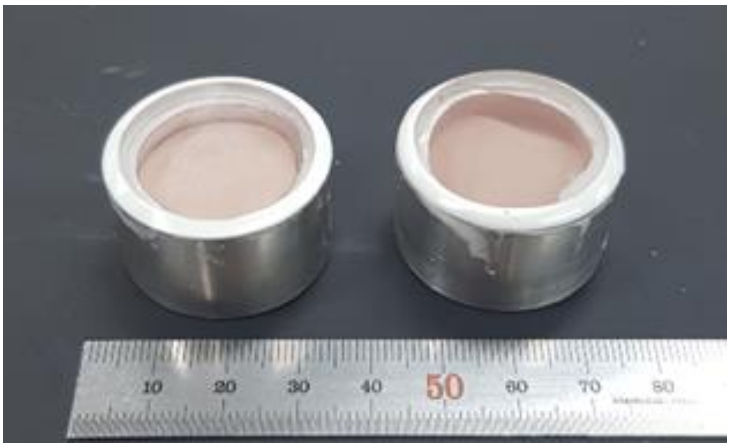

Figure 1 Photograph of developed of ^{6}LiI:Ag detectors