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Bulk crystal growth of scintillator materials for gamma ray detectors[1]

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Within the past few years, it has been demonstrated that several new rare earth halide scintillation detector crystals such as cerium doped lanthanum bromide ($LaBr_3$:Ce) have high output and improved energy deposit to light linearity and thus they can substantially enhance the performance of the next generation of gamma ray detectors. These detectors have a variety of applications in NASA hard x-ray and gamma ray missions, high energy physics, home land security and medical imaging applications. This cerium doped lanthanum bromide crystal has $\sim$1100% the light output of BGO, resulting in better energy resolution than conventional scintillators. This is equivalent to 60000 photons per MeV of deposited energy. This new series of scintillator materials promise to usher a breakthrough in the field, if sufficiently large and clear crystals of this material can be grown. These halides however are highly hygroscopic and hence pose some difficulty in growing crystals. Efforts are being made to grow this and other materials in this family of crystals and successful results have been achieved. An overview of the challenges encountered during the synthesis and melt crystal growth of these rare earth halide scintillators shall be presented.

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