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Neutron Imaging Studies of In Situ Growth of Neutron and Gamma Detector Materials NICHOLAS STRANGE, CHRISTOPHER CRAIN, FATEMA WAHIDA, ZACH STROUPE, J.Z. LARESE, University of Tennessee —
The studies described here are aimed at addressing the critical need to develop dependable crystal growth techniques of solid-state materials used as radiation detectors for both national security and medical applications. We present our activities using pulsed neutron, radiographic imaging and simultaneous diffraction techniques to examine the synthesis of both CZT and CLYC with the goal of identifying the conditions that favor the production of defect free materials. Using a pulsed neutron beam and time of flight detection methods, we exploit the penetrating power and wavelength dependence of neutron absorption to perform measurements during crystal growth. Furthermore, solid boules can be examined either inside the furnace or free standing. The objective of these studies include the validation/improvement of the modeling studies of CLYC and CZT growth behavior, the development of new/improved furnace design, and the identification of optimum growth techniques that enable the production of large boules of defect free, single crystalline materials in a timely/cost effective manner. We provide our preliminary results that include the experiential setup at LANSCE and sample neutron radiographic and synchrotron based IR images of CZT flat solid plates.

Nicholas Strange
Univ of Tennessee, Knoxville

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