Announcing the Final Examination of William Shoulders for the degree of Master of Science

Time & Location: July 2, 2013 at 10:00 AM in CREOL 102
Title: Barium Based Halide Scintillator Ceramics for Gamma Ray Detection

As our understanding of ceramic processing methods for the purpose of fabricating polycrystalline optical materials has increased over the past few decades, the race is on to bring ceramic technology to markets where single crystalline materials have traditionally been used. One such market is scintillators. This Master’s thesis focuses specifically on a class of materials attractive for use as gamma-ray scintillators. These barium based halides can potentially be utilized in fields from ionizing radiation detection in the field to high-energy physics experimentation. Barium bromide iodide and barium chloride single crystals have already showed high light yield, fast scintillation decay, and high energy resolution, all desirable properties for a scintillator. This work attempts to show the likelihood of moving towards polycrystalline scintillators to take advantage of the lower processing temperature, higher manufacturing output, and overall reduced cost. The experiments begin with identifying appropriate sintering conditions for hot pressed ceramics of BaBrI and BaCl2. Possible sources of optical loss in the first phase of hot pressed samples are investigated using a wide range of characterization tools. Preliminary luminescence and scintillation measurements are reported for a translucent sample of BaBrI. Recommendations are made to move toward highly transparent ceramics with scintillation properties approaching those measured in single crystal samples.

Major: Materials Science

Educational Career:
Bachelor’s of Ceramic and Materials Engineering, BS, 2011, Clemson University

Committee in Charge:
Romain Gaume, Chair, CREOL-NSTC
Kevin R. Coffey, Materials Science and Engineering
Yong-ho Sohn, Materials Science and Engineering

Approved for distribution by Romain Gaume, Committee Chair, on June 18, 2013.

The public is welcome to attend.