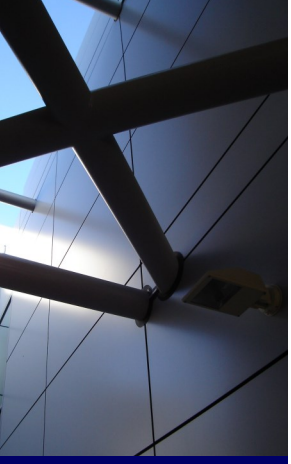

MECHANICAL ENGINEERING

The Department of Mechanical Engineering presents:

The Ph.D. Dissertation Defense of

Andrew Thomas Wieg

Friday, March 20, 2015, 2PM
in Bourns Hall A265

Non Equilibrium Current Activated Pressure Assisted Densification (CAPAD)
Processing of Aluminum Nitride Doped with Rare Earths for Laser Applications

Doctor of Philosophy, Graduate Program in Mechanical Engineering
University of California, Riverside, March 2015
Dr. Javier Garay, Chairperson

The performance of Solid State lasers and solid state lighting have long suffered from thermal management difficulties. Thermal management continues to be one of the major challenges in the development of high powered light sources such as solid state lasers. In particular, the low thermal conductivity of standard photoluminescent (PL) host materials limits the overall power output and/or duty cycle. Overheating in laser host materials can lead to performance issues and ultimately irreparable failure. One significant problem is the materials ability to tolerate thermal shock and the stresses caused by thermal gradients. A material with high thermal conductivity will be able to dissipate more heat while maintaining a smaller thermal gradient, thus reducing the degradation of performance from thermal effects such as thermal lensing and thermally induced fracture. Aluminum Nitride's wide band gap and high thermal conductivity offer the potential to improve some of these problems. In this dissertation the author presents research conducted on the processing and doping of Aluminum Nitride for photoluminescent and solid state laser applications. Areas discussed include, non equilibrium CAPAD processing of doped and undoped AlN, doping of AlN for visible and infrared emission and thermomechanical properties of doped AlN.

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