



<i>Project Title:</i>	Growth of Cu(In,Ga)Se ₂ quantum dots with different In-to-Ga compositions
<i>Project Short description</i>	<p>The main goal of the master thesis is the development of a growth process for the growth of Cu(In,Ga)Se₂ quantum dots with controlled and different In-to-Ga compositions. The composition variation and the quantum dot size can be used to control the forbidden band gap energy of the material.</p> <p>The student will prepare the chalcopyrite quantum dots by molecular beam epitaxy (MBE). The growth will be performed in an EVO-50 MBE system equipped with a RHEED setup for in-situ growth observation. The system provides a valved cracker cell to evaporate Se and conventional hot lip Knudsen cells to evaporate Cu, Ga, and In at low evaporation rates. The growth of the quantum dots on different substrates like GaAs, silicon, and other semiconductor materials will be studied. The prepared materials will be characterized by scanning electron microscopy (SEM), atomic force microscopy (AFM), Raman scattering (RS), high resolution x-ray diffraction (HR-XRD), and transmission electronic microscopy (TEM). All techniques are available at the INL facilities.</p> <p>About the hosting group (LaNaSC): The Laboratory for Nanostructured Solar Cells (LaNaSC) is directed to the development of nano- and micro-structures of chalcopyrite-type semiconductors (Cu(In,Ga)Se₂) for application in photovoltaic energy conversion. The group currently consists of a principal investigator, 4 researchers, and 2 Master students.</p> <p>The international and multi-discipline research environment at INL allows young professionals to be exposed to very different cultures and scientific topics which is a very valuable experience at this point of their studies.</p>
<i>Expected Start/end date</i>	As soon as possible
<i>Requirements</i>	<p>Academic demand: Engineering, chemistry, physics, material's science, or similar areas degree.</p> <p>Grades: The student has to have more than 90% of her/his subjects approved with grade higher than 14/20. Students with lower grades will be evaluated on a case by case.</p>

Supervisor at INL

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