



Project 14: Project Progress Summary – Fall 2009 to Fall 2015

The objectives of this three-year project have been achieved with a high degree of satisfaction even if the proposed project was not completed due to an important technical problem that can now be circumvented. We succeeded in synthesizing and thoroughly characterizing nanostructured n-type Cu(In,Al)S₂ particles using a recently patented colloidal method that had to be adapted to favor the insertion of Al into the CuInS₂ crystalline structure. However, attempts to synthesize p-type material using the same general procedure were unsuccessful. Near the end of the project, a very promising alternative method to prepare p-type materials was tested. Deposition of thin films of n-type Cu(In,Al)S₂ semiconductors was achieved using two techniques: direct deposition (~15 μm thick) and Aerosol Jet Printing, AJP (~1 μm thick). Optimization of the procedures were done. A series of experimental techniques were used to get a better understanding of the chemical, crystallographic, morphological, optical, electrical and electrochemical properties of the synthesized materials, which will be very useful to prepare high quality p-n junctions (deposition of successive p and n layers). Our industrial partner has developed an automated system dedicated to the deposition of large surface area semiconducting films that will be useful for the fabrication of large scale solar cells (up to 100 cm²). The fabrication and characterization of small area solar cells (5 cm²) under white light (AM 1.5) conditions were almost ready to be carried out at the end of the three-year project.