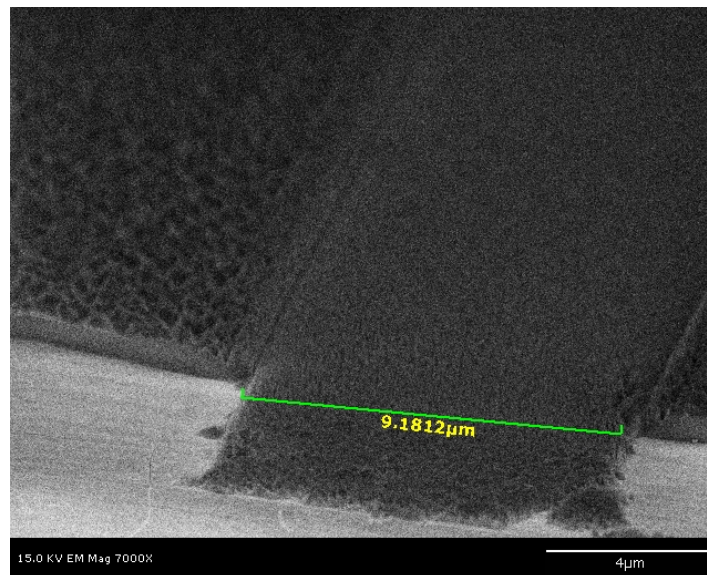


## **NDnano Undergraduate Research Fellowship (NURF) 2011 Project Summary**

Student name: Joseph Altura  
Faculty mentor name: Dr. Patrick Fay  
Project title: High-performance solar cells

The present project involved producing high efficiency multi-junction III-V semiconductor solar cells. My area of focus was the etching of trenches into the base of the solar cells into which back surface contacts could be deposited. Reactive ion etching was used for this as it can provide a very anisotropic etch. However, acquiring a good etch recipe can involve extensive testing. The purpose of my project was to find recipes that provided a good anisotropic etch.

I tested several etch recipe that incorporated varying concentrations of fluoriform ( $\text{CHF}_3$ ), oxygen gas, and sulfur hexafluoride ( $\text{SF}_6$ ). The samples would first be cleaned using an oxygen gas descum to remove photoresist that had deposited in the trenches of the samples, followed by the etch recipe, and finally a wet clean of acetone and isopropanol to remove any leftover photoresist. In between steps measurements were taken of the topology of the sample to determine how the depth of the trench had changed. Also scanning electron microscope images were taken to acquire a better image of trenches.



SEM image of a trench

By etching and cleaning samples at varying lengths of time the etch rate of the substrate silicon dioxide and the mask of photoresist could be determined. Furthermore, the SEM images helped in viewing how anisotropic the etch was and whether other problems developed. It appeared of the recipes tried that none were good candidates as they completely removed the layer of photoresist before removing the areas of exposed silicon dioxide.

