

Siemens Competition

Math : Science : Technology

Regional Finalist

Name: Elizabeth Donoway

High School: Pine Crest School

Mentor: Dr. Wei David Wei and Joseph S. DuChene

Project Title: *Effects of surface morphology on enhanced photoelectrochemical properties of nanocrystals* (Chemical Engineering; Materials Science/Nanoscience)

Delicate manipulation of nanocrystal morphology and surface structure is crucial in order to synthesize particles with specific physiochemical properties. In this study, cuprous oxide (Cu_2O) nanocrystals are fabricated and utilized in the creation of highly stable and efficacious photocathodes for use in solar technologies. The selective surface stabilization of nanocrystals by the capping molecule polyvinylpyrrolidone (PVP) allows for the fabrication of Cu_2O nanocubes and nanooctahedrons with distinct physiochemical properties. The structural stabilities of different Cu_2O nanocrystal facets were assessed by comparing the electrochemical stability of {100}-bound nanocubes and {111}-bound nanooctahedrons. The photocatalytic activities and efficiencies of Cu_2O electrodes composed of {100}-nanocubes and {111}-nanooctahedrons were also compared in order to appraise their suitability for the construction of highly efficient and economical photocathodes for the production of clean, renewable energy.