Advances in Solar Power:
Progress of copper zinc tin sulfide (CZTS)

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Abstract:
Finding renewable forms of energy has become one of the largest issues facing the modern world. One example of an alternative energy that shows incredible promise is solar power. The major way this solar power is harnessed is through the construction and usage of solar panels. One concern with these panels is the high cost of production due to expensive raw materials. The idea of creating inorganic nanoparticles using cheaper raw materials for application in solar power has great potential. Here we show how the production of copper (I) zinc tin sulfide (CZTS) can provide a cheaper, more efficient alternative to the compounds currently used. CZTS can be created using inexpensive precursors, such as copper (I) acetate, making this compound financially responsible. Overall, strides made in the formulation of a procedure over the previous semester have made the mass production and implementation of CZTS in solar energy a definite possibility.

Precursors:

- Copper(II) acetate
- Zinc(II) acetate
- Sn(II) chloride
- Sulfur
- Oleyamine
- Selenium

Procedure:

- Metal precursors combined and dissolved in oxygen-free oleyamine
- Dissolved material heated via microwave
- Sulfur/oleyamine solution added via hot injection
- Centrifuged and dissolved with toluene

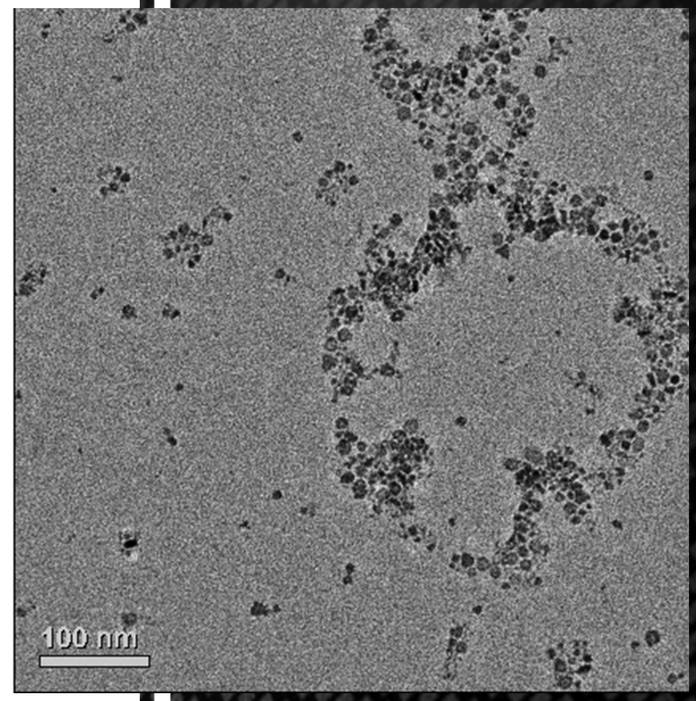
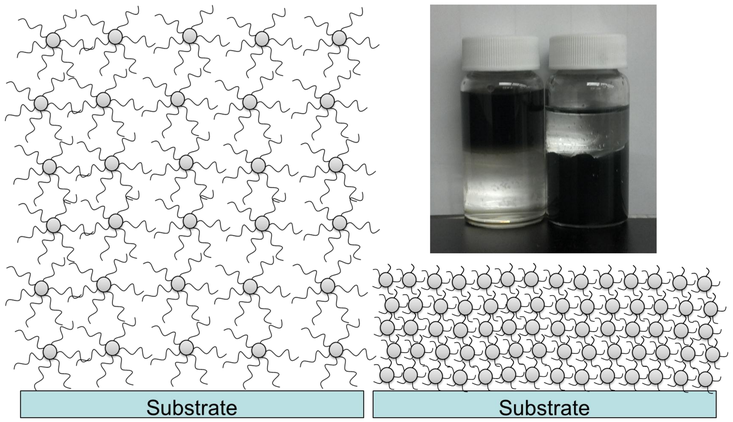


Image of CZTS material taken using (TEM) – FEI Tecnai T12

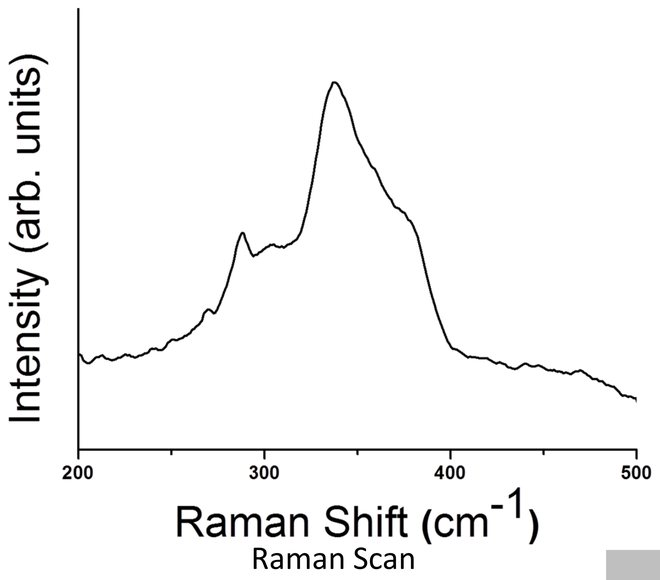
Solar Cell Diagram



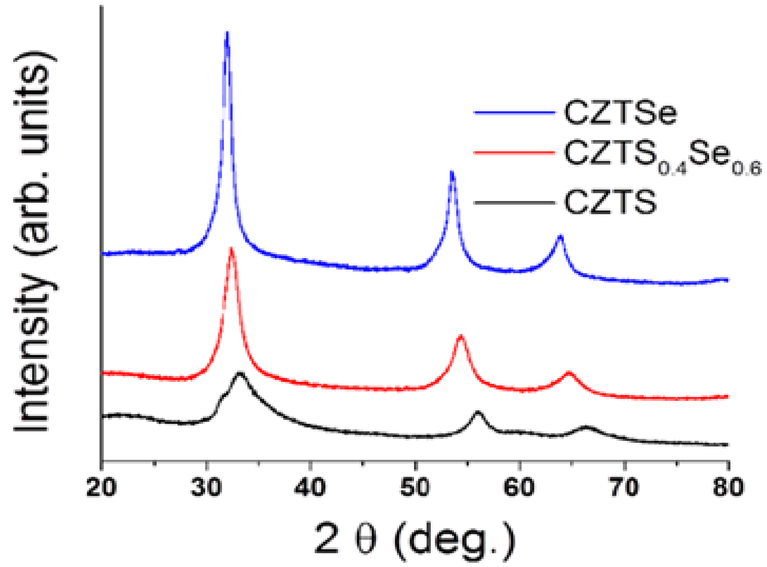
Ligand Exchange Diagram

Ligand Exchange:

- Oleyamine capped material produced
  - Stable in organic solutions
- Ligand exchange
  - Material capped with small molecules
  - Stable in polar solvents (water)



Raman Scan



X-Ray Diffraction (XRD) scan

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