Photovoltaics, Perovskite and Project Based Learning
Research Experiences for Teachers: Engineering a More Sustainable Energy Future
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Introduction
Global energy demands are projected to double in the next 30 years. Scientists are looking into alternative renewable sources of energy. Solar is the most likely candidate among renewable energies because it is the only source that can meet the demands for global energy consumption. While silicon-based photovoltaic (PV) devices have led the way for decades, in most cases, their clean room / high temperature manufacturing processes yield an energy deficiency for at least a decade after installation. Low cost, low temperature, bench top alternatives are needed.

Materials and Methods
• Manufacture Dye-Sensitized and Perovskite Solar Cells in Low-Temp / BenchTop Environment
• Compare Results to Recent Efficiency Trends

Construct Dye-Sensitized Cell With Blackberry Juice

Results - Dye-Sensitized Cells
• Blackberry Juice
  Ambient Conditions

Collect Data and Calculate Fill Factors and Efficiencies

Results - Perovskite Cells
• TiO2/CH3NH3PbI3/Spiro-MeOTAD/Au
  Mostly Ambient Conditions

Conclusion
In the lab, I was able to determine that perovskite cells did yield higher efficiencies than dye-sensitized cells. Current research has shown that in 6 short years, perovskite based devices have achieved efficiencies as high as 20.1% (KRICT, 2015). Perhaps, these new devices will replace or be used in tandem with silicon based photovoltaic devices. However, efficiency is only half of the battle. Long term stability may also be an issue. Perovskite cells tend to degenerate over time.

Curriculum

Literature Cited

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