Developing a General Chemistry Laboratory Procedure to Construct and Characterize Perovskite Solar Cells
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Objective
Our goal is to develop an affordable lab activity for undergraduate students to fabricate and test the performance of perovskite solar cells.

Perovskite-Based Solar Cells
Structure of a Perovskite
• Chemical formula ABX₃
  - larger metal cation (e.g., Ca²⁺)
  - smaller metal cation (e.g., Ti⁴⁺)
  - typically oxygen
• The most common perovskite light absorber in solar cells is CH₃NH₃PbX₃ with X as I⁻, Br⁻, or Cl⁻.

Advantages
• Low production costs
• Simple to manufacture
• High efficiency (17.9% as of 2015)
• Earth abundant materials

Disadvantages
• Degrades in humid environments
• Difficult to make large continuous films
• Contains toxic materials (lead)

Constructing the Cell
The architecture for my current version of the cell is based on that of a dye-sensitized solar cell.

By using a liquid electrolyte instead of a typical hole transport layer, I have eliminated the need for DPS, a hazardous solvent.

Experimental Work
Dye-Sensitized Solar Cell

Perovskite Solar Cell

Future Work
I. Continue to minimize use of hazardous materials
II. Finalize lab procedure
III. Write lab instructions for student use
IV. Write and submit journal article for publication

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