

Pre-Lab Exercises

Lab #11: Silicon Photovoltaics

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- 1) Read the Scientific American article on solar energy, the National Renewable Energy Lab's website on photovoltaics, and the Department of Energy's pages on silicon solar cells:

http://www.nrel.gov/learning/re_photovoltaics.html

<http://energy.gov/eere/energybasics/articles/crystalline-silicon-photovoltaic-cell-basics>

<http://energy.gov/eere/energybasics/articles/photovoltaic-crystalline-silicon-cell-basics>

- 2) Today we will be making solar cells out of single-crystal silicon wafer. Are these cells categorized as first-generation, second-generation, or third-generation cells? What category are the dye-sensitized cells generated last week?

- 3) What is the average per capita electricity consumption in the United States? For a 20% efficient silicon solar cell, estimate the area of cells needed to power an average household, assuming 5 full hours of sunlight per day and an average household of 3 people.

- 4) We learned about doping several labs ago when we doped PDMS with thermochromic pigments and nickel powder. What are the two primary dopants used in silicon photovoltaics, and how do these dopants change the properties of silicon?

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