ABSTRACT

Due to the finite reserves of and greenhouse gas (GHG) emissions from fossil fuels used to generate the electric power that makes modern society possible, it is desirable to find a replacement power source that can meet our energy needs. There are various alternative power sources that could be used to replace fossil fuels, including biofuels, nuclear, solar, and wind. Solar is the most promising since the amount of solar energy incident on the earth is thousands of times larger than current energy consumption. Furthermore, solar cells have net negative CO$_2$ emissions over their lifecycles and don’t produce radioactive waste as a result of its operation. Hence, the presentation will focus on solar cells. The presentation will consist of a broad overview of solar cell technology broken into four segments. The first segment will cover the device physics that hold for all solar cells. After that, device performance characterization will be discussed. In the third segment, various solar cell materials and designs will be described, with an emphasis on commercially available solar cells. Finally, some emerging technologies in solar cell technology will be briefly outlined, including organic solar cells, dye sensitized solar cells, and multijunction solar cells.

BIOSKETCH

James Stratton completed his Bachelor’s degree in Materials Science and Engineering at Virginia Tech in 2009. He researched and constructed Graetzel cells (a type of dye sensitized solar cell) for his senior design project. Currently he is a MEng candidate in the department of Materials Science and Engineering. For the project required in the MEng degree program, he decided to write an overview paper on the subject of solar cell technology based on his interests in this area.