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Let It Shine: Altering the Wavelength of Bioluminescent Light to Power a Photovoltaic Cell

Bioluminescence is the emission of light by living organisms. Since this light production doesn't consume fossil fuels, can bioluminescence be harnessed to power photovoltaic cells? I used Pyrocystis fusiformis, a dinoflagellate that produces blue light when shaken. Since conventional solar cells are inefficient at absorbing blue light, and blue-light absorbing solar panels are expensive, is it possible to alter the blue light to their ideal absorption wavelength, i.e., green-yellow? I used fluorescein, which absorbs blue photons and re-emits them as green-yellow. Due to survival of only a few organisms in shipment, I simulated their bioluminescence with a blue LED of the same wavelength. I "sandwiched" a plastic bag containing fluorescein between two sheets of glass, mounted it on styrofoam, placing the LED on one side of the "sandwich" and solar panel on the other. Turning on the LED allowed the panel to absorb green light emitted by fluorescein. The glow time after being charged by blue vs. green light for each solar panel was analyzed. I concluded that fluorescein does convert the LED's blue light to green-yellow, and this green-yellow light does power a solar panel. But, blue light was more efficient than green-yellow in powering the panels, likely due to poor capture of green-yellow light, improving which has tremendous potential to increase solar panel efficiency, cutting energy costs. Further research is required to optimize green-yellow light capture. Larger volume of organisms and sodium sulphide addition to reduce fluorescein photodegradation may enhance this study and help harness this earth-friendly light.