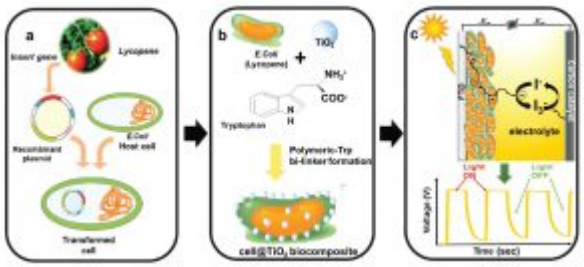
Sustainable Energy from Bacteria

Adopting solar power can be tricky, and expensive, especially in regions where cloudy skies are the norm, such as parts of Canada and Northern Europe. Now, researchers at the University of British Columbia (UBC), Canada, have devised a cheap, sustainable solar cell that relies on bacteria to convert light to energy, even in an overcast environment .



Going biogenic

The UBC team took a more affordable and greener route that bypassed the extraction process altogether. First, the team genetically engineered *E. coli* cells to synthesize lycopene, a photosensitive pigment that absorbs light in the 380-to-520-nm range. Then, the researchers coated the bacteria with a layer of TiO_2 nanoparticles, which acts as a semiconductor. Finally, the group applied the mixture to a conductive glass surface to act as the anode (along with an I^-/I_3^-electrolyte and a graphite cathode) in a dye-sensitized solar cell.

Measuring up

The researchers recorded an open-circuit potential of 0.289 V, a short-circuit current of 0.19 mA and a corresponding short-circuit density of 0.686 mA cm^{-2} (an improvement on the 0.362

mA cm^{-2} achieved by others in the field). The UBC team suggests that this method for fast and efficient synthesis of a new class of bio-hybrid photovoltaic materials directly addresses the need for reducing the manufacturing cost of biogenic solar cells. However, the team notes that there is room for improvement. Efficiency could increase through ordered deposition of the biogenic material, use of platinum as the counter electrode, minimizing dark currents, using MOF complexes as photoactivators, better matching of electrolytes and use of more light-sensitive dyes.

For more information: doi: 10.1002/smll.201800729