Developing an Organic Voltaic Cell

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Available sources of energy in the Earth are quickly depleting, necessitating the need for a renewable energy source. Biodiesel, solar, nuclear, and hydroelectric power are all sources of renewable energy, but none of them are completely suitable for worldwide usage. An organic voltaic cell was investigated in this experiment because it could provide an inexpensive, renewable, and sustainable energy source In order to develop an organic voltaic cell, multiple organic cathodes, anodes, and salt bridges were experimented with. Solid carbon (graphite) successfully acts as both the cathode and the anode in an organic voltaic cell. Most organic compounds are unable to act as a salt bridge; however, using water as a salt bridge allows voltage to flow through the voltaic cell. Acetic acid, also an organic compound, is also able to act as a salt bridge because it is able to partially ionize. A voltaic cell with water and acetic acid half-cell solutions draws slight voltage (0.3 V), but nearly no current (amps). Additional experimentation was conducted using NADH, a compound found in all living cells. NADH is easily oxidized and reduced which makes it very susceptible for use in an organic voltaic cell. An organic voltaic cell using acetic acid as the cathode, NADH as the anode, and a potassium chloride salt bridge produces about 29.4 μA and 0.23 V, which can be calculated using a standard hydrogen electrode. These results show that organic voltaic cells are possible energy sources; nevertheless, further experimentation with different organic compounds is needed in order to maximize energy output.

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