A Novel Organic Bioelectronic Circuit Component – Chlorophyll Applied Optical Capacitor

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Chlorophyll is a widely available and low-cost organo-photocatalyst, serving as an appealing green alternative to transition metal photocatalysts. This makes chlorophyll attractive in the construction of bioelectronic components. This research presents a novel approach to model the original design of the chlorophyll applied optical capacitor and stimulates light-induced electrical charging with wavelengths of light that the chlorophyll pigments are responsive to. Currently, bio-electronic circuit components—electronic devices that have biological systems integrated into them—are lacking in diversity and subsequently in areas of usage. There are no bio-electronic capacitors that utilize light as a charging source. In this study, the process of obtaining chlorophyll that is compatible with the designed capacitor is covered. Via UV-VIS spectroscopy, the acquired chlorophyll is tested for light absorption and ensured that the obtained types of A and B possess the necessary absorption rates. With titanium dioxide being recognized as the primary photovoltaic candidate for the bioelectric component, different variations of coating—mixed and discrete layering of titanium dioxide and chlorophyll—are tested. We have demonstrated capacitor charging with models of the chlorophyll applied optical capacitor with titanium dioxide as the photovoltaic. Moreover, a natural exponential best fit has been applied to the collected data to determine the time constant of the modeled capacitor when charged with 395nm light. Beyond its novelty, the new chlorophyll applied optical capacitor has significant potential in a range of important applications, including but not limited to serving as signal detectors in fiber optics systems or advancing plant-based circuitry and electricity production.