Tobacco Mosaic Virus Implemented as an Interfacial Layer in Organic Photovoltaic Cells

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Organic photovoltaics (OPVs) are flexible, light weight, and economical to produce due to low processing temperatures, solution processing, and print fabrication. This makes them optimal for a wide range of applications. However, the efficiencies of OPVs are currently not high enough for them to be viable in the market or to be able to compete with inorganic photovoltaics. Therefore the integration of new materials and methods into OPVs in order to increase their efficiency is a vital field. One way to increase the efficiency of OPVs is to increase the surface area in-between layers to allow for enhanced electron transport. The Tobacco Mosaic Virus (TMV) is a common virus with a long, cylindrical structure which can easily incorporate metal coating onto its shell. TMV has already been added perpendicularly onto cathode surfaces in microbatteries and has resulted in increased capacitance and decreased resistance. This same effect in OPVs would greatly increase the surface area and efficiency. Since TMV has not been implemented into OPVs previously, we have been working on how to add the TMV to our desired layer most effectively. Currently we are testing it as a replacement or possible dopant for the PEDOT:PSS interfacial layer. So far we have found TMV to work as an interfacial layer, but not as well as PEDOT:PSS. Using different solutions and application methods we hope to increase the effectiveness and make it a viable interfacial layer to increase OPV efficiencies.