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Proteins as opto-electronic materials?

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We have shown that electron transport (ETp), i.e., conduction, through protein monolay-ers in a solid state–like configuration is remarkably efficient, compared to most molecules, including conjugated ones.1 Some proteins also have a natural electron transfer (ET) function and ET and ETp are related, but while nature regulates ET via redox chemistry, where control over the process is achieved even at the expense of free energy and low rates (and ubiquity), in ETp no redox process is needed. This allows study of optically active, no-redox proteins, such as the rhodopsins. We studied ETp in the dark and under illumination, esp. in bacteriorohodopsin, but also in halorhodopsin and the light-oxygen-voltage (LOV) sensing domain proteins. The experimental data on ETp via proteins show poor fits with current ET models (pathway or average packing density), such as lack of distance dependence. We will discuss progress towards understanding solid-state ETp charge transport ,which will help to advance bio-opto-electronics.

1 N. Amdursky et al., Adv. Mater. 42,7142-7161 (2014) Electronic Transport via Proteins 10.1002/adma.201402304 (progress report).

Are you currently a postgraduate student? (Yes/No)

No

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