



Dienstag, 24.04.2018, 16.15 Uhr in WO 0-001

Oliya Abdullaeva

EHF- OEO

Artificial Organic Photoreceptors for Photo-Electrical Stimulation of Neuronal Cells

Although the prosthetic treatment of visual impairment has focused so far on the development of retinal implants based on inorganic electrode arrays and photodiodes there is a strong demand for alternative materials.^{[1],[2]} Especially due to their high biocompatibility, organic semiconductors are being considered as potential retinal prosthesis. A further benefit is that a self-powered photovoltaic retinal prosthesis would not require an external power source.^{[3],[4]}

In my talk I will present our results on the application of 2,4-bis[4-(N,N-diisobutylamino)-2,6-dihydroxyphenyl]squaraine (SQIB) from the class of squaraine dyes as a small molecular model organic semiconductor for the photostimulation of a model neuroblastoma cell line (N2A) grown on SQIB:PC60BM blend surfaces.^[5]

We employ patch clamp experiments to study the electrical response of the cells during illumination. Additional transient photocurrent measurements are conducted to investigate the signaling pathway. Our study shows that SQIB:PC60BM blend thin films can stimulate N2A cells via a pure capacitive coupling resulting in a strong depolarization of the membrane potential and fast sodium currents through voltage-gated sodium channels. Furthermore I will discuss a second type of signaling pathway, possibly photothermal or photochemical events occurring on a slower time scale at the electrolyte-organic semiconductor interface leading to a stimulation of voltage-gated potassium channels.

[1] Gekeler, K. *et al.*, *Current Opinion in Ophthalmology* **29**, 239-247 (2018).

[2] Edwards, T. L. *et al.*, *Ophthalmology* **125**, 432-442 (2018).

[3] Ferlauto, L. *et al.*, *Nature Communications* **9**, 992 (2018)

[4] Maya-Vetencourt, J. F. *et al.*, *Nature Materials* **16**, 681 (2017).

[5] Abdullaeva, O. S. *et al.*, *Langmuir* **32**, 8533-8542 (2016).