Photoactive Neural Interfaces Using Quantum Dots

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Abstract

Colloidal quantum dots offer attractive electronic, optical and surface properties.1 Although the synthesis, electronic structure and optoelectronic applications of quantum dots have been widely explored, little attention has been paid to their potential for neural interfaces. In this talk, I will discuss quantum dot sensitized photoactive neural interfaces that can effectively and safely photostimulate neurons in device architectures. I will describe InP-based photoelectrode structures for neural photostimulation. I will discuss quantum dot synthesis and prove structural formation via crystallographic, structural and optical analyses, and incorporation into functional device structures for neural interfaces.2 Moreover, I will explain our recent findings on the control of Faradaic and capacitive (non-Faradaic) charge transfer mechanisms at nanobiojunctions.3 I will demonstrate that the control of charge-transfer at nanoscale can led to the photostimulation of neurons at low light intensity levels within the retinal irradiance levels. These findings open-up new approaches towards superior neural prosthesis.

Keywords: *Biointerface, photostimulation, quantum dot, bulk heterojunction*

References

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Biography

Sedat Nizamoglu received his Ph.D. in Electrical Engineering in 2011 at Bilkent University, Turkey. Immediately after graduation, he continued as a research fellow at Harvard Medical School in USA. His research focuses on the demonstration of innovative devices and interfaces for the applications to energy, medicine, and environment. He was recognized by MIT Technology Review as Innovator Under 35 Turkey. Recently he also received an ERC Starting Grant.