Graphene technologies for bioelectronics and neuroprosthetics

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Establishing a reliable bidirectional communication interface between the nervous system and electronic devices is crucial for exploiting the full potential of neural prostheses. Despite recent advancements, current microelectrode technologies evidence important shortcomings, e.g. challenging high density integration, low signal-to-noise ratio, poor long-term stability, etc.

Thus, efforts to explore novel materials are essential for the development of next-generation neural prostheses. Graphene and graphene-based materials possess a rather exclusive set of physicochemical properties holding great potential for biomedical applications, in particular neural prostheses.

This presentation will provide an overview on fundamentals and applications of several graphene-based technologies and devices aiming at developing an efficient bidirectional communication with electrogenic cells and nerve tissue. In this respect, the presentation will review recent technology developments exploring the capability of graphene-based devices for recording and stimulating electrical activity in electrogenic cell cultures and the nervous system.

The main goal of this talk is to discuss pros and cons of graphene technologies for bioelectronics and neuroprosthetics, and at the same time to identify the main challenges ahead.

Figures

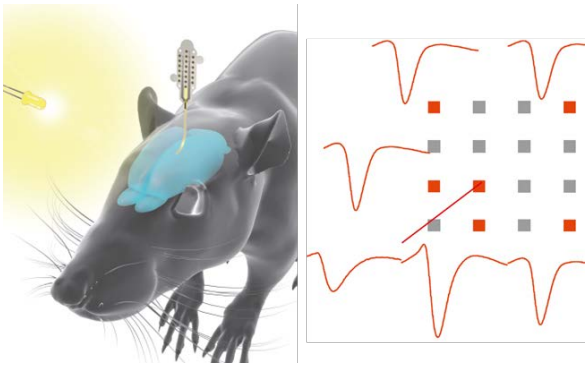

Figure 1: Left: artistic representation of the preclinical evaluation of a graphene neural probe. Right: Recording of in-vivo cortical activity using a flexible array (4x4) of graphene micro-transistors [1].

References

[1] Blaschke et al., arXiv:1611.05693

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