Graphene in neural interface systems: perspectives and applications

Elisabet Prats-Alfonso

Institut de Microelectrònica de Barcelona, IMB-CNM (CSIC), Campus UAB, 08193. Barcelona, Spain.
Centro de Investigacion Biomedica en Red, Biomateriales y Nanomedicina (CIBER-BBN), Madrid, Spain

elisabet.prats@csic.es

Abstract

One of the scientific challenges of the coming years is to advance in the study and understanding of the brain function. Recent advances in micro and nanotechnologies have generated a wide interest in applying them to build neural prostheses. These systems provide the neurophysiologists with tools for recording with multiple electrodes the neural activity in *in vivo* and also *in vitro* conditions. However, despite the advances in this technology, there are still some drawbacks to be tackled [1]

An ideal neural interface should create seamless integration [2] into the tissue to allow its reliability for long periods of time. Additionally, it should register the brain activity with enough accuracy to obtain relevant information from neural signals. To accomplish all these requirements the interface material should include many physical and chemical properties.[3]

The latest advances in new materials [4] are being used to build novel neural prostheses that provide improved signal/noise ratio and greater biocompatibility. In this regard, due to its properties, graphene seems to be one of the most promising materials to provide an improved biologically-artificial interface. In particular, the flexibility, biocompatibility and chemical stability among other properties, place the graphene in a privileged position for being the ideal neural interface.[5]

In our group we have started to develop electrodes and Solution Gated Field Effect Transistors (SGFETs) based on CVD graphene to assess the potential of this new material for recording neural signals. Interestingly, its use for building SGFETs would allow the reduction of the sensing area and thus can increase the density of active points. Here, we present a general overview of the latest advances in neural interfaces systems, and specifically to the graphene based ones which have been carried out by our group.

References

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