Graphene interfaces and devices for selective modulation of glial cells

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Abstract

Graphene based materials and devices has been in the spotlight for the next generation of neural interfaces. Most of the results achieved focused on optimizing the interface between grahene materials and neurons. However, the major cause of failure of neural engineering interfaces is the inflammatory reaction caused by glial cells, called astrocytes. These cells were frequently neglected or marginally considered as a barrier to be overcome between neural implants and neuronal targets. However, astrocytes are now recognized as responsible for the modulation of synaptic transmission, neurovascular coupling and control of central and peripheral nervous system homeostasis [1]. In addition, the alteration in their signalling and functional mechanism are implicated in all acute and chronic neuropathologies. Accordingly, knowledge on the interaction between astrocytes and graphene is essential to develop new implant-based therapies for the treatment of neurological disorders, such as epilepsy, brain tumours, and Alzheimer's and Parkinson's disease [1,2].

In this talk, we report on the results achieved on the interaction of graphene-based materials with astrocytes [3], and on the ability to successfully modulate selectively astrocytic function by means of GO-based electronic devices.

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