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# Graphene-based devices for selectively triggering calcium signals in brain astrocytes

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Abstract

Due to its advantageous electrical and mechanical properties, Graphene represents a potentially suitable material as neuronal interface for electrical stimulation and modulation of brain signals.
Astroglial cells in the brain processes and exchange different neuronal information through intracellular calcium signaling communication to critically regulate the cerebral homeostasis and control the synaptic transmission.
Increasing experimental evidence indicates the positive impact of graphene nanoflakes and functionalized graphene membranes on viability and physiological properties of astrocytes [1]. However, the biophysical mechanisms of interaction of Graphene nanomaterials with astrocytes need to be further investigated.
We exploit different properties of Graphene-based devices to achieve selective electrical stimulation of astrocyte brain cells [2]. We performed Fluo-4 calcium imaging experiments on primary rat cortical astrocytes plated on indium tin oxide (ITO) coated with Graphene Oxide (GO) or reduced GO (rGO) films. We demonstrate that electrical stimulation of primary astrocytes plated on conductive substrates of rGO induces rapid calcium dynamics. Conversely, astrocytes on insulating GO thin layers trigger slower, stronger calcium response.
Our results support the hypothesis that cell stimulating by GO and rGO activates distinct calcium pathways on astrocytes depending on the electrical conductivity of the device. This finding suggests the great potentialities of graphene devices for engineering advanced glial interfaces devoted to the selective modulation of astrocytes dynamics in the study and therapy of brain functions and dysfunctions [3].
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## References

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