Translating Graphene into Clinical-Grade Bioelectronic Devices for Recording and Stimulation in Brain Pathologies

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The use of nanomaterials in medicine is growing at an unprecedented rate for a variety of therapeutic, diagnostic or combinatory applications. Graphene and other 2D materials possess properties that make them attractive materials for biomedical applications. What is needed today is the determination of the unique characteristics graphene and 2D materials possess and how to transform them into value and solution propositions for specific clinical challenges.

This talk will illustrate how graphene-based 2-dimensional materials with their electrical performance and the suitability for integration into flexible devices can constitute a versatile platform that could help address many of the current challenges in neural interface design. Graphene and other 2D materials possess an array of properties that can enable enhanced functional capabilities for neural interfaces. The high carrier mobility and the field effect associated to single-layer graphene allows for the implementation of an active sensor configuration that offers significant advantages with respect to the classical passive metallic electrodes, including a reduced sensitivity to external noise sources and the capability to record infra-slow brain activity monitoring neurological disorders. An alternative graphene material configuration will also be described, intentionally designed to offer high levels of charge injection capacity combined with long-term stability.

References

[1] Kostas Kostarelos, Melissa Vincent, Clement Hebert, and Jose A. Garrido. Graphene in the design and engineering of next-generation neural interfaces. ***Advanced Materials*** (2017) 29, 42:1700909**.**