Flexible monolayer Graphene-on-Insulator for biomedical applications.

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Graphene appear more and more as a very promising material for bioelectronics in vitro (1-4) as well as in vivo(5). It combines biocompatible, optical transparency and electrical conductivity. We have explored the use of graphene-on-polymer for enabling at the same time biosensing and tissue engineering.

The first-generation of our system is a graphene-based scaffold that looks like a very thin, transparent plaster. Based on that material, we are building an innovative bandage technology platform based on graphene-on - insulator film in order to better support chronic wounds. In particular, I will insist on the possibility to combine therapeutics (such as wound healing acceleration) with diagnostics features (such as infection detection) in the same device.

Following these properties, we have elaborated a graphene-based scaffold that looks like a very thin, transparent plaster (Fig 1) integrated in commercial bandage that is indented to be applied in direct contact with an open wound. We believe these films will have some impact in healthcare, as they target some important and poorly addressed diseases such as pressure ulcers and diabetic foot ulcers. I will present the preclinical results on animal studies and the perspectives of their commercial (1) use for wound-care, in particular in the treatment and diagnostics of chronic wounds that affect the diabetics and elderly.

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REFERENCES

[1] Impact of crystalline quality on neuronal affinity of pristine graphene. Farida Veliev, et al. Biomaterials, pp.33−41 (2016).
[2] Recordings of spontaneous spikes evoked in hippocampal neurons by flexible and transparent graphene transistors, Farida Veliev, et al. Frontiers in Neurosci. doi: 10.3389/fnins.2017.00466 (2017).
[3] Farida Veliev et al., Frontiers in Neurosci. doi: 10.3389/fnins.2017.00466 (2017).
[4] Farida Veliev et al. 2D Mater. vol. 5 045020 (2018).
[5] Antoine Bourrier et al., Adv. Health. Mat. vol. 8 , 1801331, (2019).

FIGURES

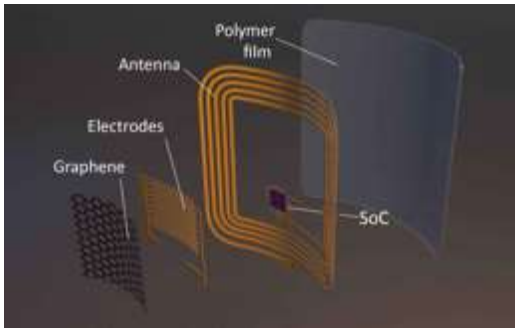

Figure 1: embedded graphene biosensors for wound care .