# Graphene-based materials included in hydrogels as platforms for skin diseases treatment

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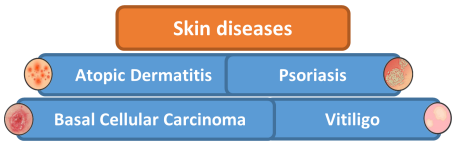
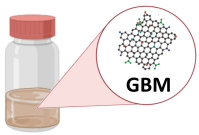
Nanotechnologies

## 1. Background

- Skin diseases are the fourth most common of the leading causes of global disease burden.
- Treatment of skin diseases include phototherapy with drugs, which possess poor stability, low skin penetration and high toxicity [1].
- Graphene-based materials (GBM) possess strong near infrared (NIR) absorption, large surface area, and biocompatibility, which reveals their potential as photothermal and drug delivery agents [2-4]
- In this study, we propose the topical administration of carbopol 974P (CP) hydrogels containing nanographene oxide (GOn), and reduced nanographene oxide (rGOn) as new platforms for dermatologic diseases treatment.

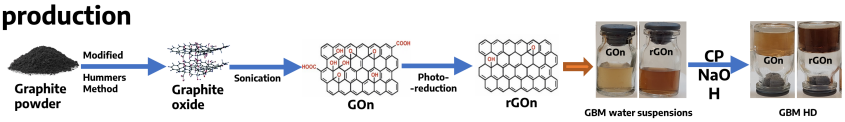



GBM hydrogels (HD)

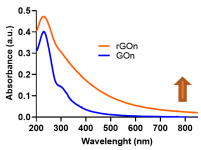
- ✓ High NIR region absorption
- ✓ Biocompatibility
- ✓ High surface area

## 2. GBM production

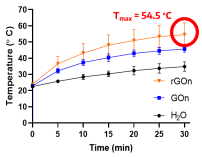



## 3. GBM characterization

UV/Visible spectra



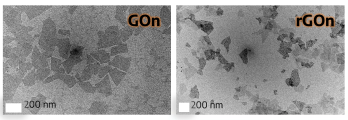

Heating by NIR irradiation



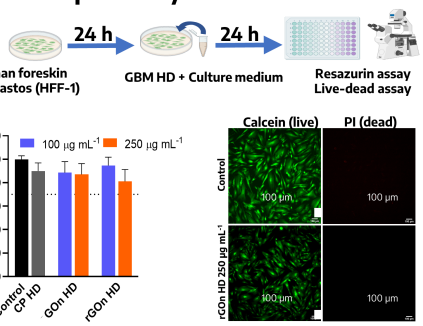

Zetasizer

| Sample | Size (nm) | Surface charge (mV) |
|---|---|---|
| GOn | 206.0 ± 5.0 | -46.7 ± 2.1 |
| rGOn | 247.0 ± 8.0 | -41.6 ± 0.4 |

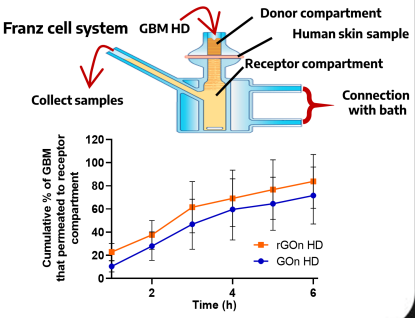
Transmission electron microscopy




## 4. Biocompatibility




## 5. Skin permeability




## 6. Conclusions

- GOn and rGOn HD were non-toxic (ISO 10993-5:2009(E)) and can permeate through the skin. Revealing a great potential to be used as skin phototherapy agents.

## 7. References

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