

# African Graphene Flagship Letter of Intent

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## Abstract

Graphene, discovered in 2004, is considered as the wonder nanomaterial with astonishing properties which deeply marked the condensed matter and Materials Physics. This layer of one atom thick has revolutionized the nanotechnology and stimulated a race in the global market to dominate the emerging high-tech applications based on this material and its derivatives. In the context of this race, the European Union research council mounted a large action named EU Graphene Flagship, with budget of €1 billion, to take graphene from the realm of the academic research to industry.

We propose to build an African Graphene Flagship gathering academic laboratories, industrials, and NGO. We also suggest that South Africa coordinates this flagship regarding its large expertise in graphene like materials.

## Introduction

Graphene is the first isolated two-dimensional (2D) material [1]. It consists of a layer of carbon atoms arranged in a honeycomb lattice. Its 2D character is due to its thickness which is of one atom, one million times thinner than a human hair. It exhibits unique properties with a very high electronic mobility, one hundred larger than in silicon, which may give rise to ultra-fast electronic devices. It is also transparent, flexible but stronger than steel and diamond, which paves the way for applications of foldable electronics.

Graphene is already used in different applications: sensors, energy storage, water purification, water desalination, inks, drug delivery [2] ...

The discovery of graphene has given rise to the emergence of 2D family compounds and van der Waals heterostructures combining layers of 2D materials, like Lego bricks, to engineer new properties [3].

## Graphene Global Market

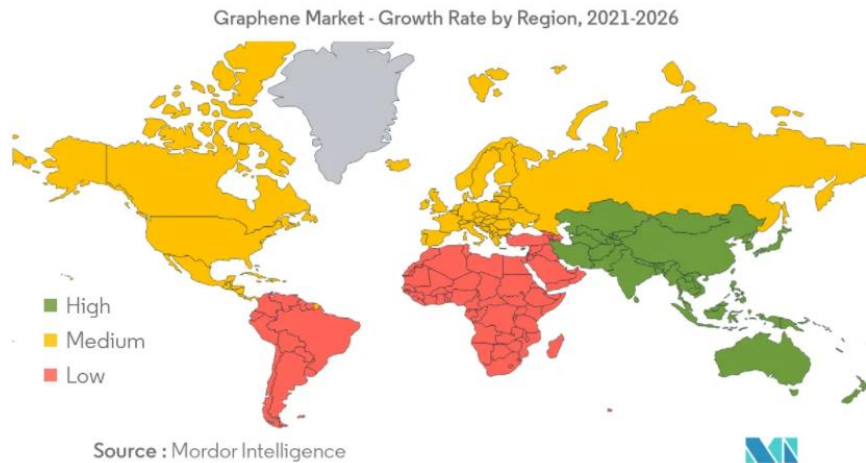
These 2D materials are the subject of a global race to dominate the market of the graphene based technology.

The European Graphene Flagship has emerged in 2013 to keep Europe in this race [4]. It is a consortium of approximately 170 academic and industrial research groups in 22 countries coordinated by Chalmers University of Technology (Sweden).

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Despite these European efforts to stay in the race, the graphene market is expected to be dominated by Asian countries as shown in the following figure



### How can Africa become an effective actor in this Global market?

We propose to mount an African Graphene Flagship to:

- Promote research on graphene like and 2D systems
- Bridge the gap between academy and industry in 2D material Science
- Set up a multidisciplinary research activity on 2D materials
- Support student mobility between the consortium members
- Built a joint Master and Ph.D programmes
- Improve employability and entrepreneurship of especially youth and women” as mentioned in 2063 Africa Agenda.
- Training of young researchers in Advanced 2D Materials to build “human capital” and technological “know-how” in Africa.

We also suggest that South Africa coordinates this flagship regarding its large expertise in graphene like materials.

African countries involved in the flagship should agree to:

- Share their equipment within Memorandum of understanding
- Exchange scientists and experts
- Mount joint projects within working groups
- Rise fundings from African Union, governments, NGO, Industrials...

### References

- [1] <https://www.nature.com/collections/hhvmfzkmks#intro> (Graphene focus : Nature Nanotechnology)
- [2] <https://www.graphene-info.com>
- [3] Zeng et al. Chem. Rev., 118, 6236 (2018)
- [4] Graphene Flagship. Available online: <https://graphene-flagship.eu/> (accessed on 1December 2020).