Towards large scale production of high quality processable graphene

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Graphene can be applied in a wide range of applications, for example in the field of electronics and energy storage materials. However, it is still at the early stage of commercialization and there are mainly two challenges that need to be addressed simultaneously. The first one is -under economical and ecological aspects- a lack of scalable production routes towards the quantities that are required for industrial applications. The second problem is related to the difficulties in processing graphene, in particular graphene's poor dispersibility in environmentally friendly and low boiling point solvents.

Although graphene oxide (GO) and liquid phase exfoliated graphene (LPEG) could be produced in large scale, these methods suffer from the lack of physical properties. GO is well processable but possesses low conductivity whereas LPEG exhibits small lateral sheet sizes, which easily restack together.

Electrochemically exfoliated graphene (EG) with large graphene sheets, low defects and high electrical conductivity is a good alternative to take over the graphene market instead of GO and LPEG. With new and improved methods, electrochemically exfoliated graphene, which is dispersible in environmentally friendly solvents without additives or surfactants could also be produced on large scale. Remarkably these materials are even re-dispersible after complete drying.

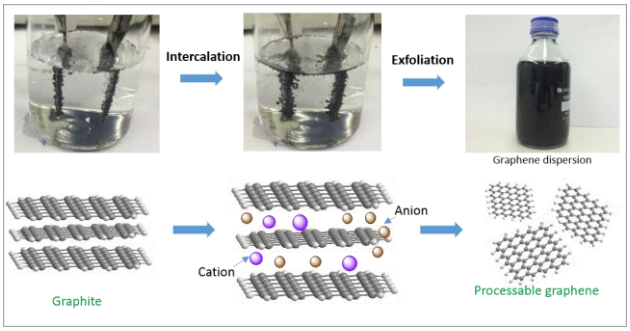

Figure 1: New protocol towards high quality processable graphene

The new EG production methods could address scalability and processability issues and help to overcome most of the problems towards the commercialization of high quality graphene. The EG produced by new stablished methods is particularly promising for applications like conductive inks, energy storage, polymer composites and sensors.

References

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