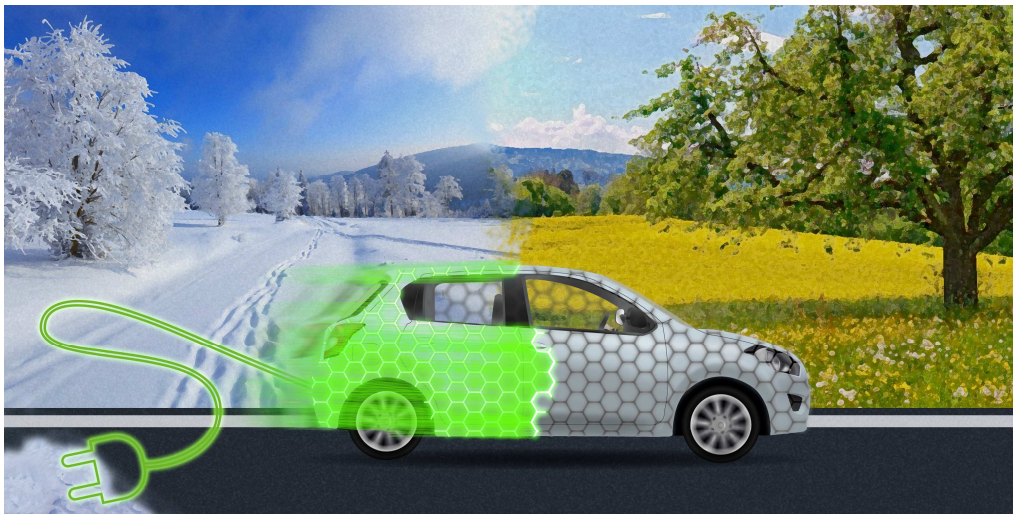
Method to produce multilayer crystalline graphene (GRAL)

Ionic-liquid assisted synthesis for the production of multilayer graphene for use in lithium-ion batteries

Invention

The unique physical and chemical properties arising from graphene may lead to remarkable advantages in the fields of electronics and energy storage devices. Its superior electronic conductivity and the single- to few- atoms thickness are particularly appealing for the use as anode material for lithium-ion batteries. Graphene´s electrochemical properties, relevant for its use in batteries, are strongly depending on its synthesis. Among different methods proposed so far, liquid phase exfoliation turned out to be promising but the low yield of this technique limits its use to niche applications. On the other hand the reduction of graphene oxide, a low–cost method suitable for bulk production, leads to a low-quality material which, in the lithium-ion battery field, is outperformed by the conventional graphite-based electrodes.



The innovative method object of this invention is an ionic liquid-assisted microwave exfoliation of expanded graphite. It allows the bulk production of high-quality multilayer crystalline graphene flakes. Used as anode material in lithium-ion batteries, at low temperatures (< 0°C) it shows advanced lithium-ion storage performance, when compared with commercially available graphite.

Commercial Opportunities

The commercial potential of this method lies in the use of a low-cost and environmentally-friendly process for the bulk production of high-quality multilayer crystalline graphene. Moreover, in terms of lithium-ion storage properties, the material has been proven to be comparable to the commercial graphite at temperature above 0°C, but it shows strongly improved performance at temperatures below 0°C.

Current Status

An international PCT-patent application has been filed. On behalf of the University of Münster, PROvendis is seeking partners for licensing this technology.

An invention of the University of Münster.

Competitive Advantages

- **Enhanced Li^+ storage at low temperatures (< 0 °C)**
- **High-quality graphene offers low first-cycle irreversible capacity**
- **A production yield of approximately 100%**
- **Suitable for mass production**
- **Cost effective, environmentally-safe process**

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