## Method for producing flake graphene by way of direct exfoliation of graphite



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# **Patent information**

Technology readiness level: 9

Who are we?

Title: "Method for producing flake graphene by way of direct exfoliation of graphite"

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Inventors: Ludwika Lipińska, Magdalena Aksienionek, Michał Łepecki, Andrzej Marcjaniuk, Michał Woluntarski, Zbigniew Wiliński, Sławomir Cendrowski

The object of the invention is a method for producing flake graphene. More particularly, our invention relates to a method for producing flake graphene by direct exfoliation of graphite in solutions, especially in aqueous solutions. The graphite used in this method can be synthetic, natural flake, intercalated, heator microwave-expanded graphite. Sizes of graphene flakes obtained by our solution can vary from a few to several hundred microns.



EHT = 5.00 kV WD = 4.5 mm

Signal A = InLens Sample ID = CE1 Signal B = ESB Stage at T = 0.0 ESB Grid = 590 V

#### **Technology Advantages**

Graphene flakes obtained by the method of direct exfoliation of graphite in solutions have a crystal structure with a low defect density on the flake surface, which results in high electrical conductivity and good mechanical properties. Sizes of graphene flakes obtained by our solution can vary from a few to several hundred microns. Such a large range of sizes is closely correlated with the size of graphite flakes before the process of sonication, which constitute a precursor of graphene flakes, as a final product. What is more, this method allows obtaining flakes with a single layer to a few or a dozen layers depending on the process conditions.

### Application

Graphene flakes fabricated using patented method have a lot of potential applications. Their mechanical properties and the fact that they are much lighter than steel makes them very attractive for automotive and aerospace industries, by creating opportunities to reduce mass of vehicles and airplanes. This will allow for the use of smaller amounts of fuel and reduction of pollutants emitted into the atmosphere. Due to its electrical properties, graphene obtained by direct exfoliation of graphite can be applied in electronics (e.g. conductive inks and pastes), optoelectronics, it can also be an excellent material for electrodes in supercapacitors and lithium- ion batteries.

#### The potential behind the technology

The idea of our invention is to use the anomalous thermal expansion of water, which increases its volume during freezing. This phenomenon allows the use of aqueous solutions for effective graphite intercalation. In order to allow water molecules to penetrate between the carbon layers, a compound that reduces surface tension is added, thereby ensuring excellent wettability of the graphite. Thanks to this we are able to develop a cost-effective and efficient method for producing graphene using safe and widely available solvents such as water.



#### **Collaboration type**

License agreement or sale agreement

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#### komercjalizacja@imif.lukasiewicz.gov.pl



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