



Exfoliation method to produce 2D layered materials (2DLMs)

A cost-effective and environmentally friendly exfoliation technology enabling the large-scale production, stabilization, and storage of high-quality two-dimensional layered materials (2DLMs).

Institutions



Institute of
Physics of
Materials,

Czech Academy of Sciences



Centre for
Advanced
Materials

CEMEA Application,
Slovak Academy of Sciences

Development Status

Laboratory-validated exfoliation technology with demonstrated production of multiple classes of 2D layered nanomaterials. International patent application filed.

IP Protection Status

International patent application:
PCT/SK2023/050004 –
A Liquid Phase Exfoliation
Method and an Exfoliating
Medium.

Partnering Strategy

Available for licensing, industrial collaboration, co-development projects, and scale-up activities focused on advanced nanomaterials production and applications.

The Problem

Two-dimensional nanomaterials such as graphene, boron nitride, MXenes, and MoS₂ offer exceptional functional properties but remain challenging to manufacture at industrial scale. Existing production methods often suffer from low yields, high energy consumption, expensive equipment, or the use of hazardous solvents. In addition, exfoliated nanosheets frequently re-stack and sediment during storage, reducing their usability.

Technology Description

The technology introduces a liquid-phase exfoliation method based on a highly viscous water-based paste composed of sodium silicate (waterglass) and cellulose fibres. The medium enables efficient low-shear exfoliation of layered materials while minimizing structural damage and defect formation.

The process is suitable for a wide range of 2D materials, including graphene, boron nitride, MXenes, aluminosilicates, MoS₂, and nanoclays, etc. The exfoliating medium also serves as a storage matrix, preventing sedimentation and re-stacking of nanosheets. The process is recyclable and uses inexpensive, non-toxic raw materials.

Commercial Opportunity

The technology provides a scalable route for industrial production of advanced 2D nanomaterials for applications in energy storage, fuel cells, electronics, sensors, protective coatings, thermal management, and functional nanocomposites.

Its combination of low production cost, environmental sustainability, and broad material compatibility makes it attractive for nanomaterial suppliers and manufacturers of advanced functional materials.

