

# International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

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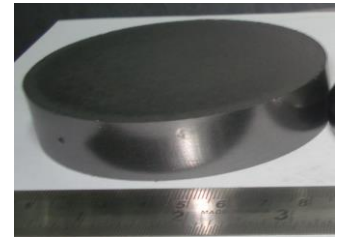
## Exfoliated graphite and its value-added products

### Overview

The stacked parallel layers in natural graphite flakes (NGF) are separated by 0.34 nm and the layers in a stack are attached or bonded with a weak Van der Waal forces. For successful exfoliation, overcoming the van der Waal attraction between the adjacent layers is crucial. The best feasible method is to decrease the attractions by increasing the distance between the adjacent layers via oxidation and chemical intercalating reactions. During oxidation of graphite, the functional groups like hydroxyl, epoxide and hydroxide etc are inserted between the layers leads to increase in d-spacing from 0.34 to 0.70 nm. Due to thermal shock, the functional moieties try to escape and create porous structure is termed as exfoliated graphite (EG). EG can be moulded into various desired shapes (sheets, tapes, seals, and boards) by mechanical compaction without adding any sort of binders. Self-binding capability of the porous-structured material is a unique characteristic of this technology. Our technology demonstrates the production of EG in bulk quantity by chemical intercalation and thermal exfoliation of NGF. It is a cost-effective and continuous process for bulk production.

### Key Features

- Binder-free compaction of material
- Shape-tailored material
- Very light weight
- Density-controlled compaction
- Sandwich or reinforced material with better mechanical properties
- Efficient and cost-effective



Digital photograph of compacted disk

### Potential Applications

- Flexible sheets
- Flexible tapes
- Bipolar plates
- Seals
- Reinforced seals, sheets and tapes etc
- Ultra light weight boards



Digital photograph of EG based material compacted in various shapes

### Intellectual Property Development Indices (IPDI)

- Scale-up and pilot plant is established
- Demonstration of bulk quantity through thermal reactor is done
- Various types of prototype module has been established

Status	1	2	3	4	5	6	7	8	9	10
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### Centre for Carbon Materials (CCM)

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