KB ELEMENT
Graphene · Think different

Previous Imaginations
Are Now Becoming Reality

Korea Best for World Best

If the only product we developed becomes the best in Korea, We are a company that makes the world's best products.

Environmentally-conscious ESG management company
[Headquarters Address] 11, Sinchon 1-ro, Paju-si, Gyeonggi-do
[Key Technologies] Research and Development of Graphene Mass Production and Application of Graphene in Eco-friendly Process
[Inquiries and submissions] info@kb-element.co.kr | Tel. 031-948-2931 | Fax. 031-948-2932
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GREETINGS

Dear.
KB- ELEMENT started with the technology needed to control deadly static and particles in semiconductor and display processes, and based on this advanced technology, it succeeded in mass-producing new materials Non-oxidized graphene ' in the era of the 4th industrial revolution.

Graphene was difficult to commercialize due to environmental problems and high manufacturing costs. There have been two important issues with the commercialization of graphene, but KB Element is working on it.

Graphene research has also been initiated to address antistaticity. In addition, we have completed the development of heat dissipation products (Gap fillers, Encapsulants, TIM pads, etc.).Research and development are underway to delay the thermal runaway phenomenon by applying graphene to secondary batteries.

If the only product we have developed becomes the best in Korea, we will become a company that makes the world's best products
We will try to commercialize graphene.

CEO of KB ELEMENT CO., LTD. | **Bae Kyoung-jeong**

COMPANY INFO.

Company name	KB-ELEMENT Co., Ltd.
CEO	Kyoung-Jeong Bae (Former Samsung Semiconductor / Samsung Display for 21-years of experience)
Foundation date	Sept. 1, 2016
Number of employees	24 (as of Mar. 2023)

Field of business	Manufacturing of non-oxidized graphene / Development of related materials and products Antistatic materials, antistatic solution, and related products High efficiency heat dissipation materials, heat dissipation paste, and related products Polymer fusion materials, super capacitors, etc.
Main products	·Non-oxidized graphene and antistatic coating materials ·Non-oxidized graphene-based thermal conductivity materials for high heat dissipation

HISTORY

2023
- Factory Registration (Paju City, Gyeonggi Province)
- Selection of companies specializing in military service : a research agent
- Certification of Excellent Technology Companies (TCB-113)
- **Bridge Investment Success (payment of KRW 7 billion)**

2022
- Headquarters relocation (Paju City, Gyeonggi Province)
- Global IP Star Company Selected
- **Minister of SMEs and Startups Award**
  Ministerial Award for Graphene Technology
- Winner of Entrepreneurship Grand Prize (Korea Economic TV)
- Intellectual Property Management Certification

2021
- Certification of 100 companies of materials, parts, and equipment from the Ministry of SMEs and Startups
- KOTRA Global Jump 300 Companies Certification
- Certification of Global Accelerating Companies by Entrepreneurship Promotion Agency
- **Certification of Excellent Technology Companies (TCB-T2)**
- **Series A Success (payment of KRW 7 billion) - Material, Parts, Equipment**
  Startup 100 : Best selected company in composite materials field
- **Target of Small and Medium Enterprises in Suwon: Technology Innovation Sector**

2020
- **Registered as a partner company: Samsung Display, LG Display**
- Designated as a 'root technology specialized company' by the Ministry of SMEs and Startups
- Selected as an R&D project by the Ministry of SMEs and Startups (local production of Graphene heat dissipation material)

2019
- Graphene-Bio sensor development (Small and Medium Business Administration)

2018
- Headquarters Factory Registration
- IBK Industrial Bank of Korea selects the first term of "Changgong"
- **Check materials and parts specialized parts companies**
- Certification of Export Frontier Companies in Gyeonggi Province

2017
- Confirmed as a Korea Technology Finance Corporation venture company
- **Graphene - Hybrid technology development**
- **Acquired ISO 9001, ISO 14001**
- Establishment of a corporate research center
- **Selected as an R&D project by the Ministry of Small and Medium Business** (Graphene-Hybride)

2016
- Establishment of KB-Element Corporation

55 Total DOMESTIC AND OVERSEAS PATENTS

Applications : 37 | Registration : 14 | Registration : 2 | Trademark registration : 2

17 Graphene Manufacturing

7 Heat dissipation material

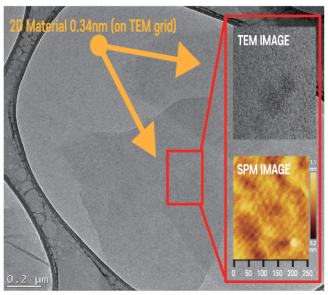
6 Composites technology

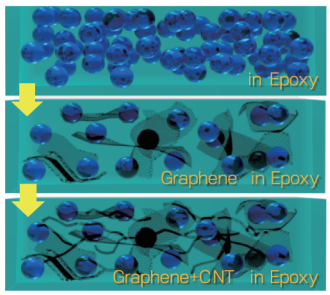
7 Coating Technology

SAMSUNG DISPLAY · SAMSUNG ELECTRONICS · ULVAC · INFAC · HYUNDAI IND.CO.,LTD. · LX Hausys · CHOKWANG PAINT · KCC · CORE · Maxwell TECHNOLOGIES · BOE · CSOT · TIANMA · TRULY · LG Display

| BUSINESS> non-oxidized graphene

[KB-ELEMENT's project specially designed for inactive graphene]





Classification	Descriptions
Electrical Conductivity	100 times greater than copper (Cu)
Electronic Mobility	100 times greater than semiconductor silicone
Strength	200 times greater than steel
Thermal Conductivity	Twice as high as diamond (approx. 5300W / m • K)
Transmittance	Light mostly transmitted; transparent and properties unchanged (97.7%@450nm)
Stretchability	Hexagonal net-shaped; stretchable up to 20% of its own area

Classification	HPGR
Carbon type	High Pure Graphene
Type	Solution or Powder
Layers	10 ↓
Size (D50_㎛)	About 1
Defect (ID / IG)	0.3 ↓
Oxygen Contents (%)	3.0 ↓
Conductivity (S/m)	10^4 ↑
SSA (m^2/g)	100 ↓

① Graphene(TEM,SPM)
Structures formed of two-dimensional planar graphene (0.34 nm thick) (ease of versatility)

② Carbon Path
Form a conductive path in contact with the surface (Graphene) and the line (CNT) (Hybrid application possible)

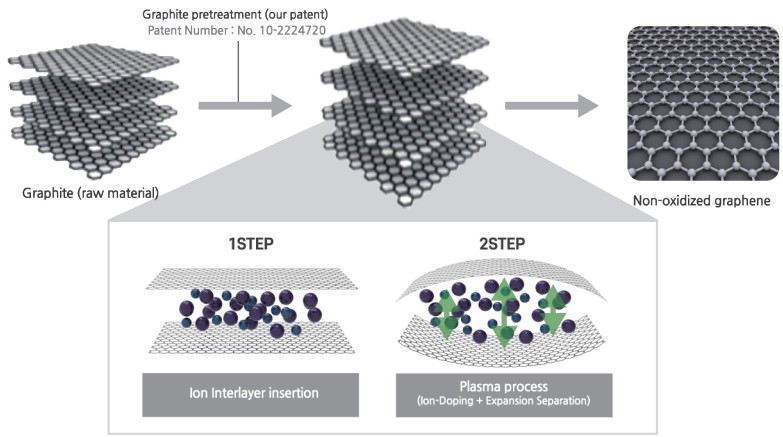
③ Graphene
A thin honeycomb-structured layer of 2-dimensional planar carbon atoms in SP2-hybridized configuration; as thin as 0.2nm (size of an atom) and both physically and chemically safe

KB-ELEMENT's Npn-oxidized graphene core technology

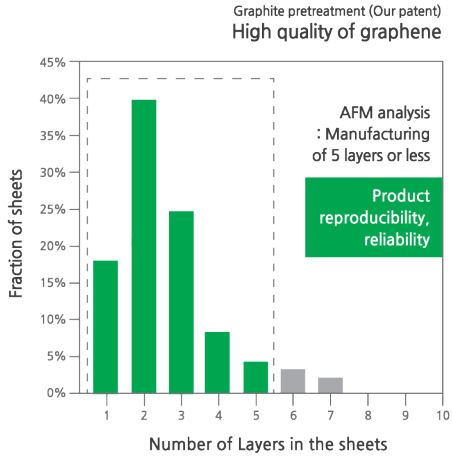
Main properties - HPGR (Graphene Solution or Powder)

[Manufacture of non-oxidized graphene]

Non-oxidized graphene (5th generation technology)
(Eco-friendly technology)



Plasma peeling (domestic/overseas patent) Patent No. 10-2240358



[The Competitiveness of KB-Element]

Innovative process technology
Atmospheric pressure plasma process technology

Process simplification (5 steps)
mass production capacity 21 tons/year

Chemical free Eco-friendly
manufacturing technology

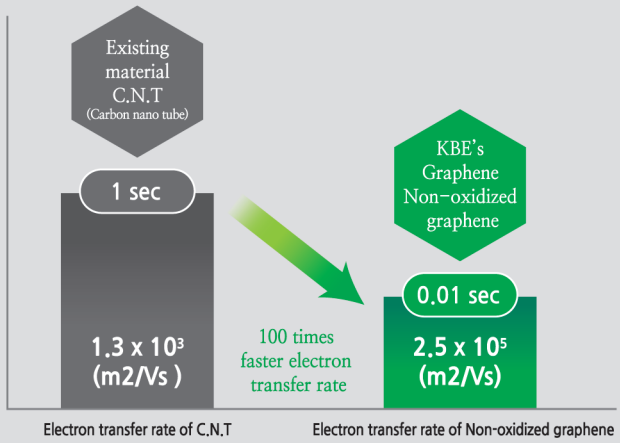
Price competitiveness
1/10 price compared to before

| BUSINESS>Antistatic (Anti-ESD) Composite Materials

[Antistatic Technology?]

· Prevents a product defect resulting from static electricity in advance
· Increase in a necessity of low-resistance coating because of the improvement of mobile device performances
· Coatings for mobile devices, displays and equipment applied

Competitive edge resulting from the application of graphene materials to the display manufacturing industry



* Accredited test evaluation: Korea Polymer Testing Laboratory

Reduce quality defects, Improve production rate

Increase production utilization (1.2% ↑)

Applicable to large screens

[PRODUCT>Antistatic Coating Solution]

Classification	Graphene Hybrid A	Graphene Hybrid B
Binder type	Epoxy	Silane
Shelf-life	3-months (@RT) / 6-months (@4℃)	3-months (@RT) / 6-months (@4℃)
Coating period	6~12months	6~12months
Substrate	Aluminum Anodize (Black Ceramic, Raydent, Stone Plate)	Aluminum Anodize (Black Ceramic, Raydent, Stone Plate)
Hardening time	6H (@RT) or 1H (@80℃)	8H (@RT) or 1H (@80℃)
Dry time	30 min	30 min
Surface Resistivity	10^6 ~ 10^9 Ω/SQ	10^4 ~ 10^8 Ω/SQ
Hardness	HB	9H
Removability	O	X
Heat resistance	<120℃	<200℃

GRAPHENE Hybrid Solution

· Superior antistatic effect compared to CNT coating
· Stable conductivity of 10^5 ~ 10^8 Ω
· Increased coating stability compared to CNT coating
· Available coating on various substrates such as **Ceramic, Al Anodize, Polymer Substrate**
· Have **Antistatic, conductive performance** at the same time
· Stable due to **reduced particle generation**
· Electrostatic half-life performance with in about 2 seconds

[Necessities of Thermally Conductive Composite Materials]

Rapid increase in heating by unit area due to lightweight, thin, small-size and high-integration trends in electronic goods; decrease in product life and reliability consequently

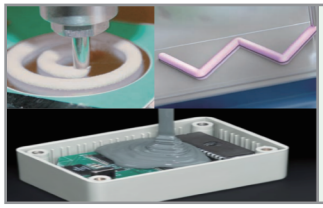
Increase in the heat-dissipation issue due to the wide spread and high output of high-voltage LED chips; 57% in life expectancy and increase in efficiency by 14% when LED temperature drops by 10˚C

01
Small size in electric & electronic goods
Lightweight Highly functional

02
Fully dense parts
Highly integrated
Serious heating issue

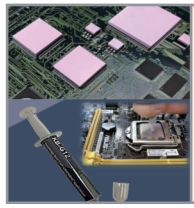
03
Rising demand for polymeric composite materials

[Heat-dissipation Port-folio]



01. Filling type G/Filler, Encapsulant

Liquid material for dispensing and potting electronic components



02. Thermal Grease, TIM Pad

Grease (liquid) and pad (solid) that fills the pores on the metal surface of electronic components and increases heat transfer rate

1. GAP FILLER

CLASSIFICATION	UNIT	KBE-TGFS1080	KBE-TGFS3080	KBE-TGFS6090
Thermal conductivity	W/mk	1.0	3.0	6.0
Viscosity (mixed)	mPa.s	10,000 ~ 20,000	10,000 ~ 20,000	Development
Hardness	Shore 00	20~30	30~40	
Volume resistance	Ω·cm	$1x10^{14}$	$1x10^{14}$	
Flammability	UL-94	V-0	V-0	

2. T.I.M. PAD

CLASSIFICATION	UNIT	TPDS1060	TPDS3080	TPDS6090	TPDS9094
Thermal Conductivity	W/mK	1.0	3.0	6.0	9.0
Hardness	Shore 00	20 ~ 30	40 ~ 50	60 ~ 70	85(+10)
Flame rating	UL-94	V-0	V-0	V-0	V-0

3. ENCAPSULANT

	Classification	UNIT	TPTS1060	TPTS2085
Uncure	Viscosity	cps	3,100 / 2,800	35K/20K/32K
Cured	Hardness	Shore A	55	50
	Thermal conductivity	W/m·K	0.7	2.0
	Flammability	UL-94	V-0	V-0

[KB-ELEMENT's Thermally Conductive Composite Materials]

- *Silicone Binder*
- *Thermally Conductive Inorganic Materials*
- *Graphene*

Low Density

Innovation High Thermal Conductivity

[Applications]

Automobile

Heat-related plastic injection products such as an engine cover LED headlamp housing, heat-dissipation structure

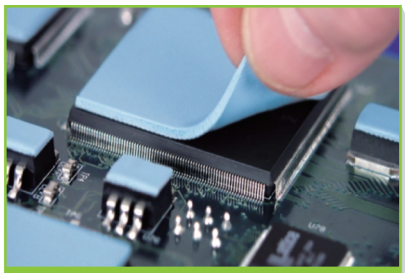
Display, Home Appliances, Semiconductor

Heat-dissipation structures including bottom chassis, housing, frame and SMPS heat sink

LED

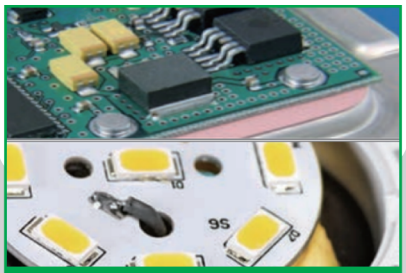
LED lamp heat-dissipation structure, housing, organ Thermal Interface Materials(TIM)

[Heat-dissipation Materials]



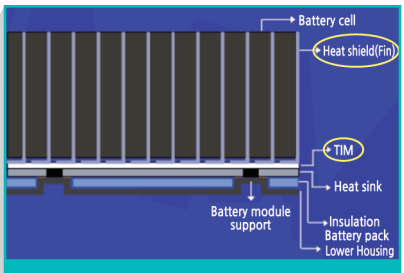
Heat dissipation material for semiconductor/mobile

·Thermal Conductivity of CPU (Vertical)
·Thermal interface adhesion
·AP CHIP (vertical heat conduction)



Electronic/industrial field, heat dissipation material

·ACF, Solar ESS heat dissipation material
·Display(LED etc) heat dissipation material



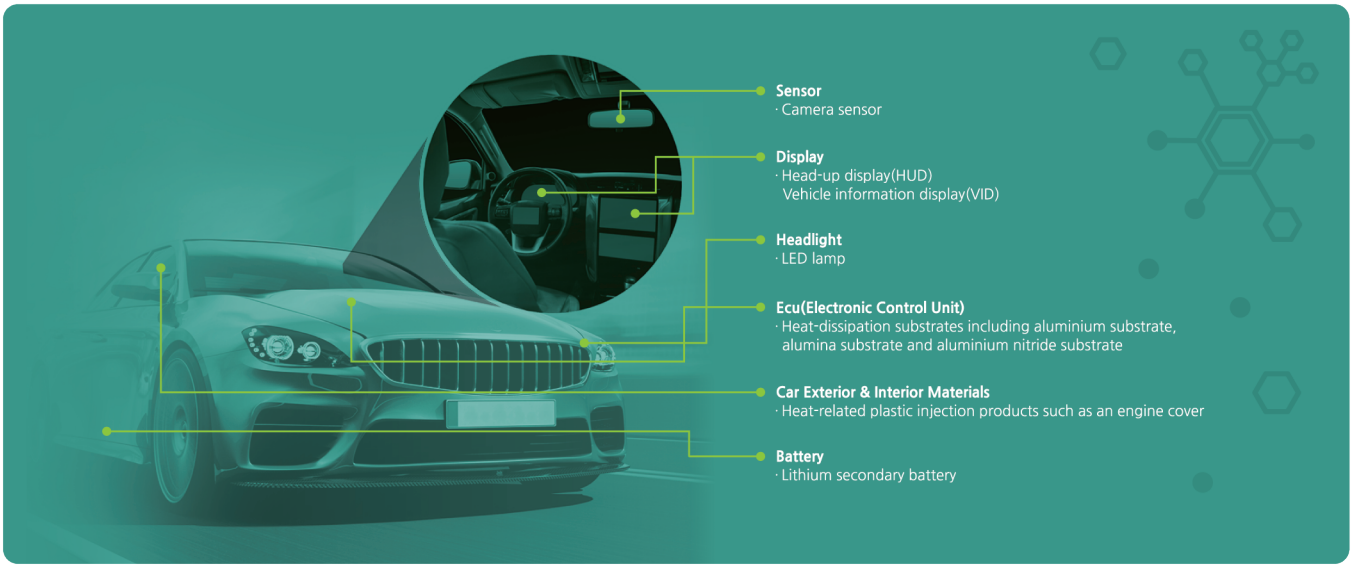
Heat dissipation material for automobile/battery

·Exisiting TIM (Battery CELL Type)
·Inverter, Power supply, LED Head lamp eat dissipation material

[Automotive / Heat-dissipation Materials for Battery Packs]

·Heat-dissipation materials for the battery system
·Lightweight composite materials electrical & electronic components
·Heat-dissipation materials for lighting and display

[KB-ELEMENT Product Applications]



Lightweight
Able to reduce weight by 30%, Compared to conventional Ceramic products

Highly Heat Dissipation
Able to enhance heat-disspation effects by 20%, compared to conventional ceramic products

Strengths
Cost Efficient, Highly Functional and Differentiated

Simplified Parts & Processes
Parts and processes simplified with heat-dissipation, lightweight and shielding composite materials

Highly Shielding
Able to enhance shielding effects by more than 20% with highly conductive non-oxidized graphene, compared to conventional materials