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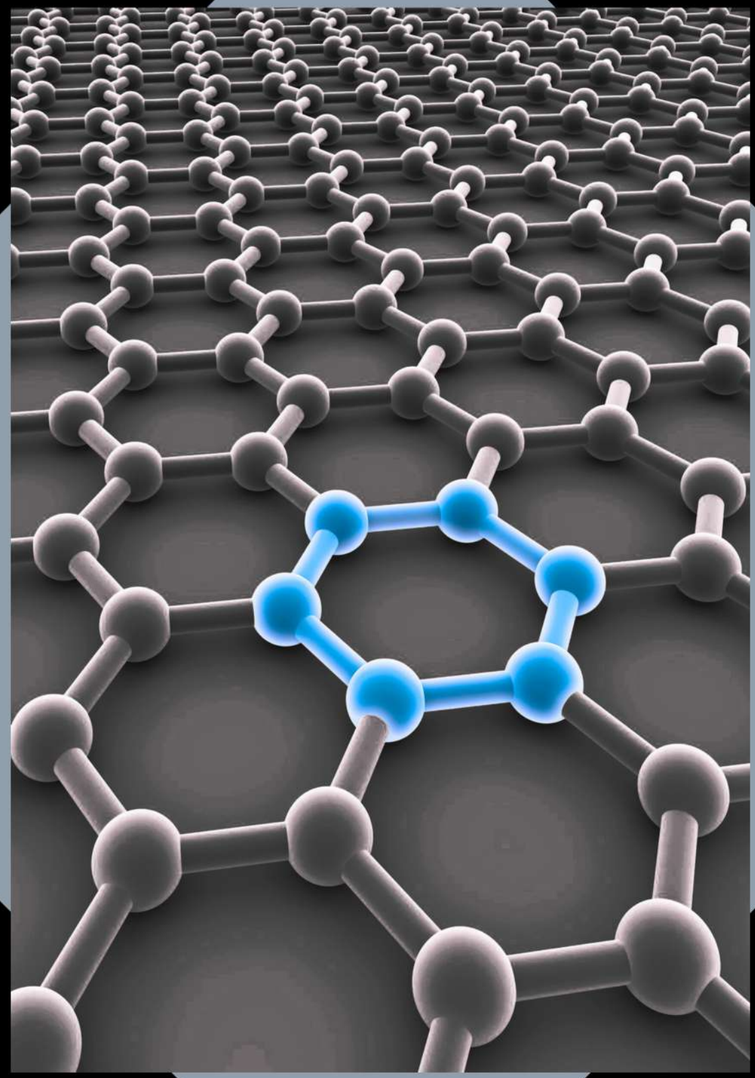
Nava Graphena™

Graphene for Textile

Exploring applications and benefits of graphene in modern textile technology



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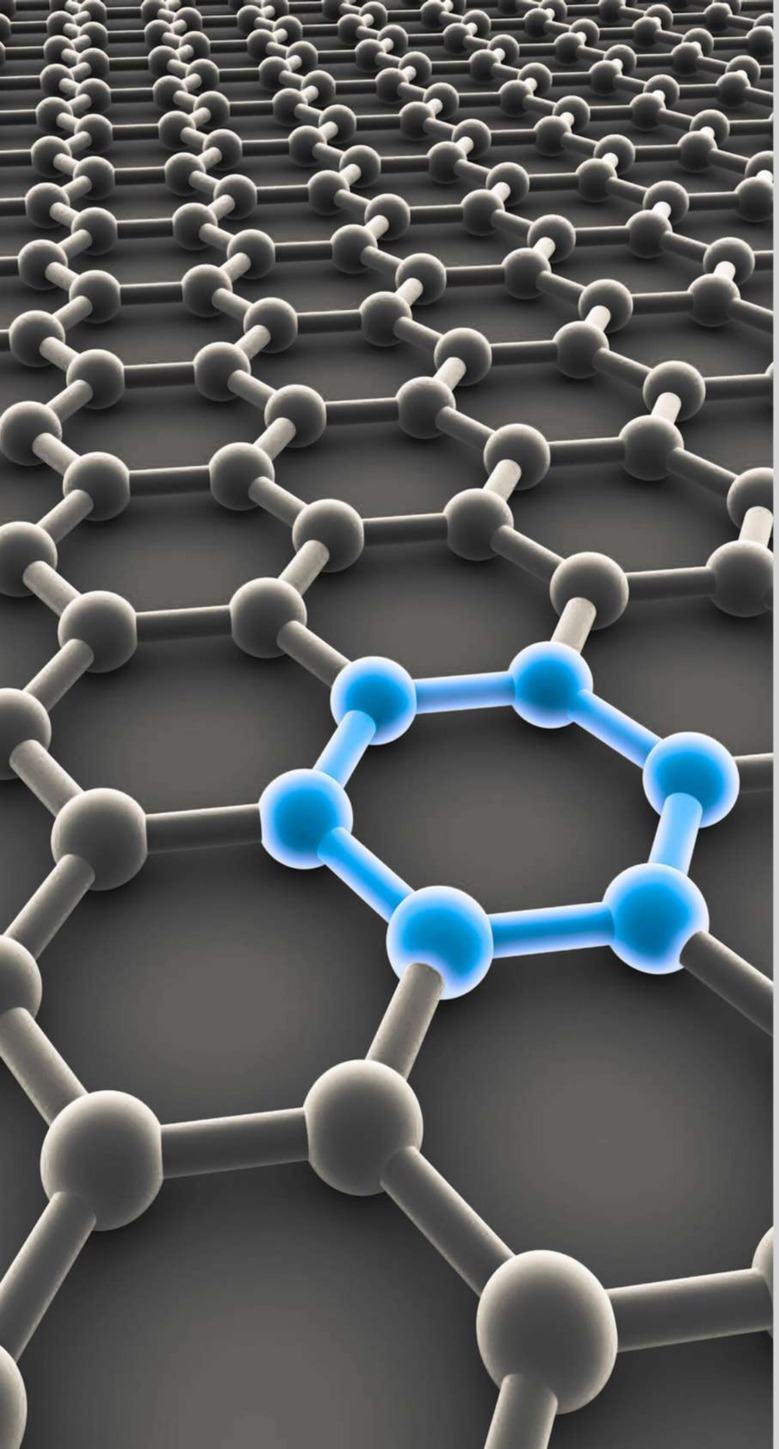
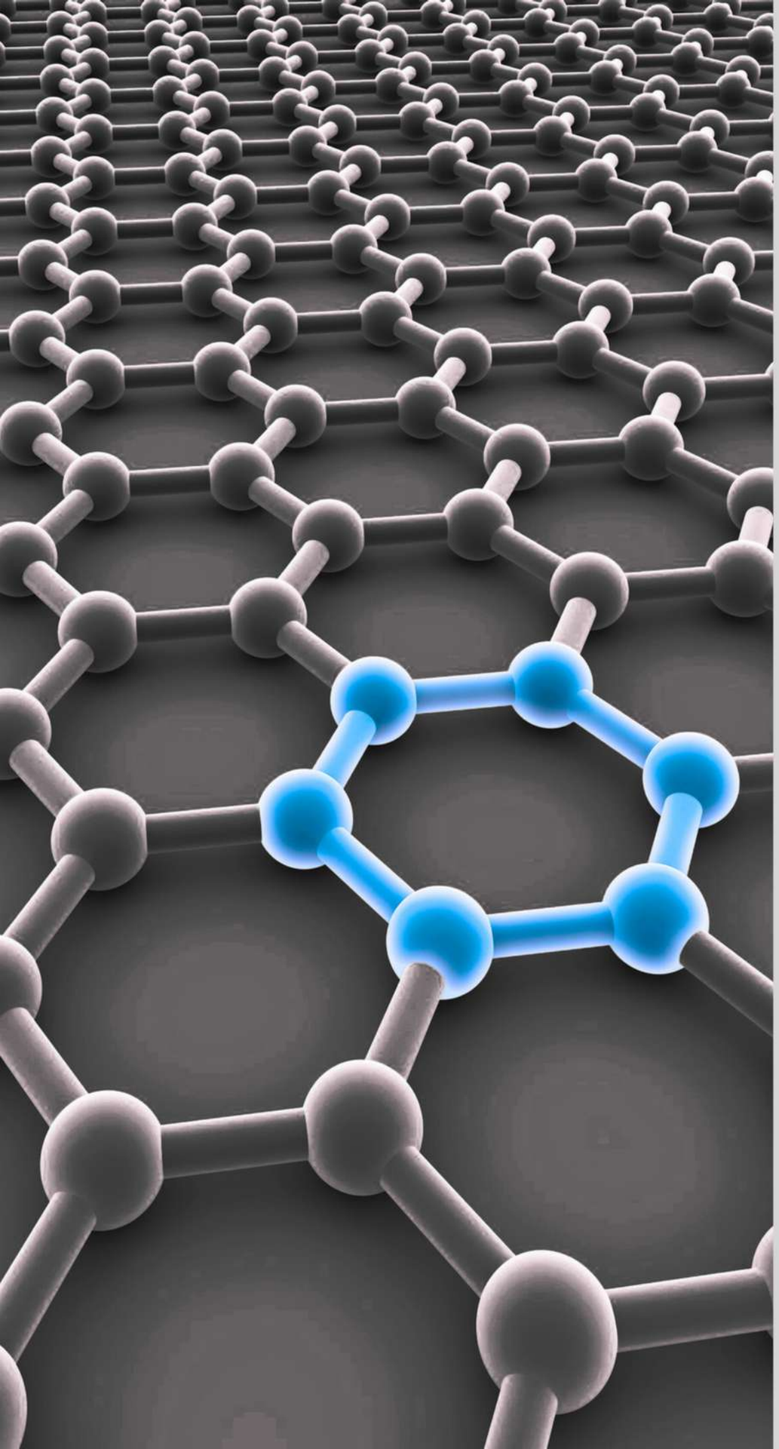


Innovative Applications of Graphene in Textiles

Graphene enhances clothing durability, comfort, and moisture management in revolutionary ways.

- Graphene is a single layer of carbon atoms arranged in a two-dimensional honeycomb lattice. It is renowned for its extraordinary properties,
- High electrical conductivity, strength, and flexibility.
- This material is considered a promising candidate for various applications, such as in electronics, energy storage, and composite materials, due to its unique characteristics.



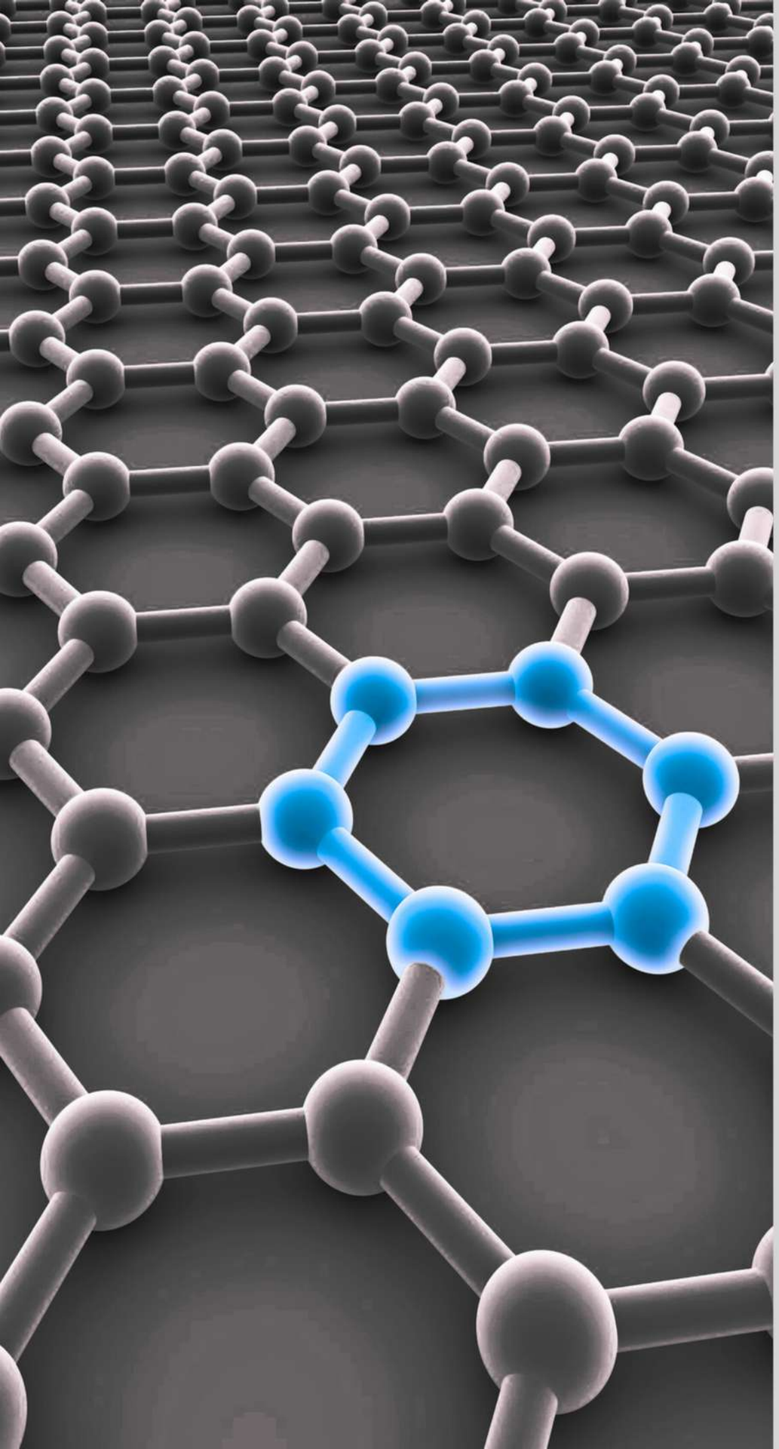
Innovative Applications of Graphene in Textiles

Types of Graphene

The different properties between
Graphene Oxide & Reduced Graphene Oxide

- Graphene Oxide
  - Non-Electric Conductivity
  - Non-Thermal Conductivity

- Reduce Graphene Oxide
  - Electric Conductivity
  - Thermal Conductivity



Innovative Applications of Graphene in Textiles

The other properties of Graphene

- **Antibacterial and Antiviral**
- **UV Protection**
- **Anti-Corrosion**
- **High Strength and Flexibility**
- **Thin and Transparent**
- **Environmental Friendly**

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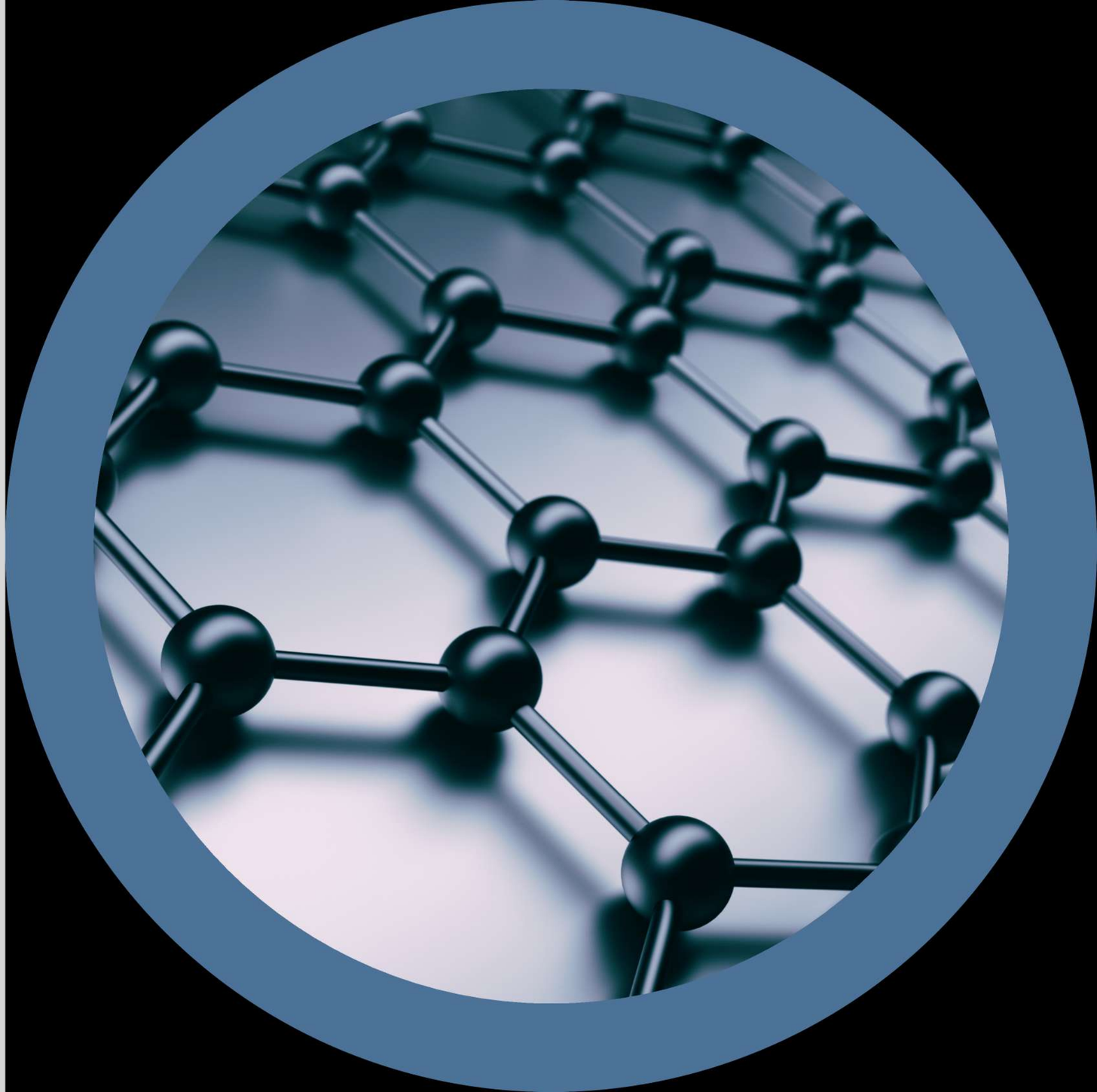

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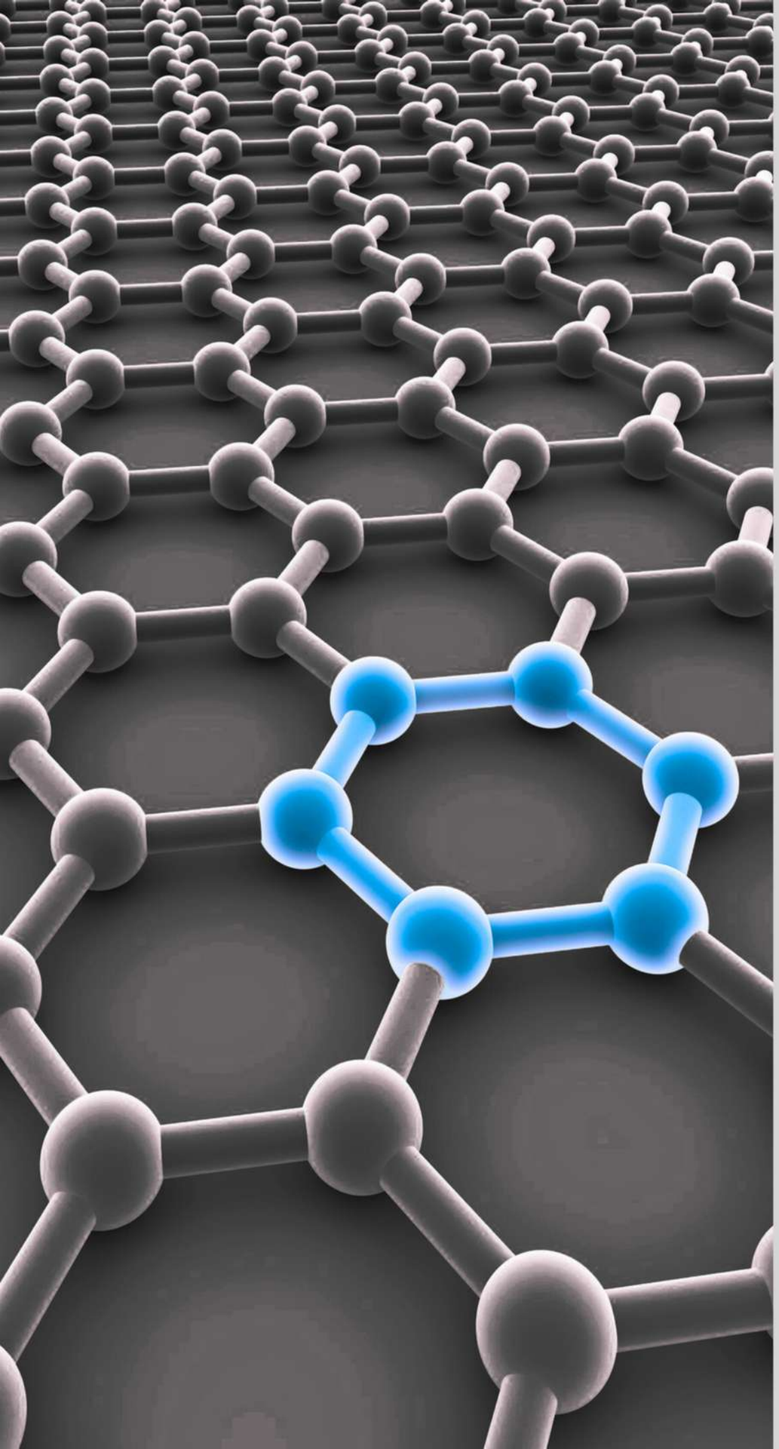


Why Nava Graphena?

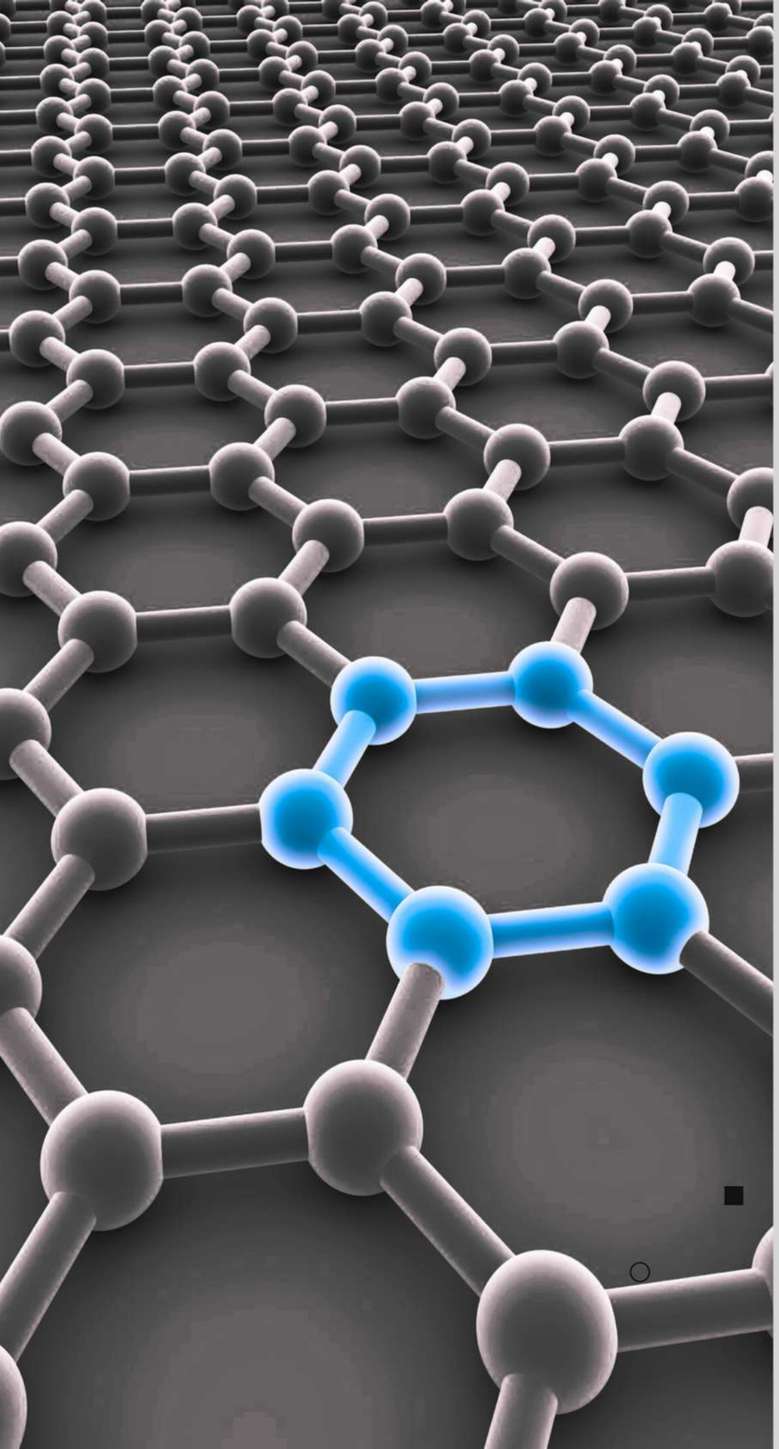
The combination of chemicals with Premium Graphene From ALL GRAPHENE (Thailand product)

Graphene Oxide(GO)

Powder Solution

Reduced Graphene Oxide(rGO)

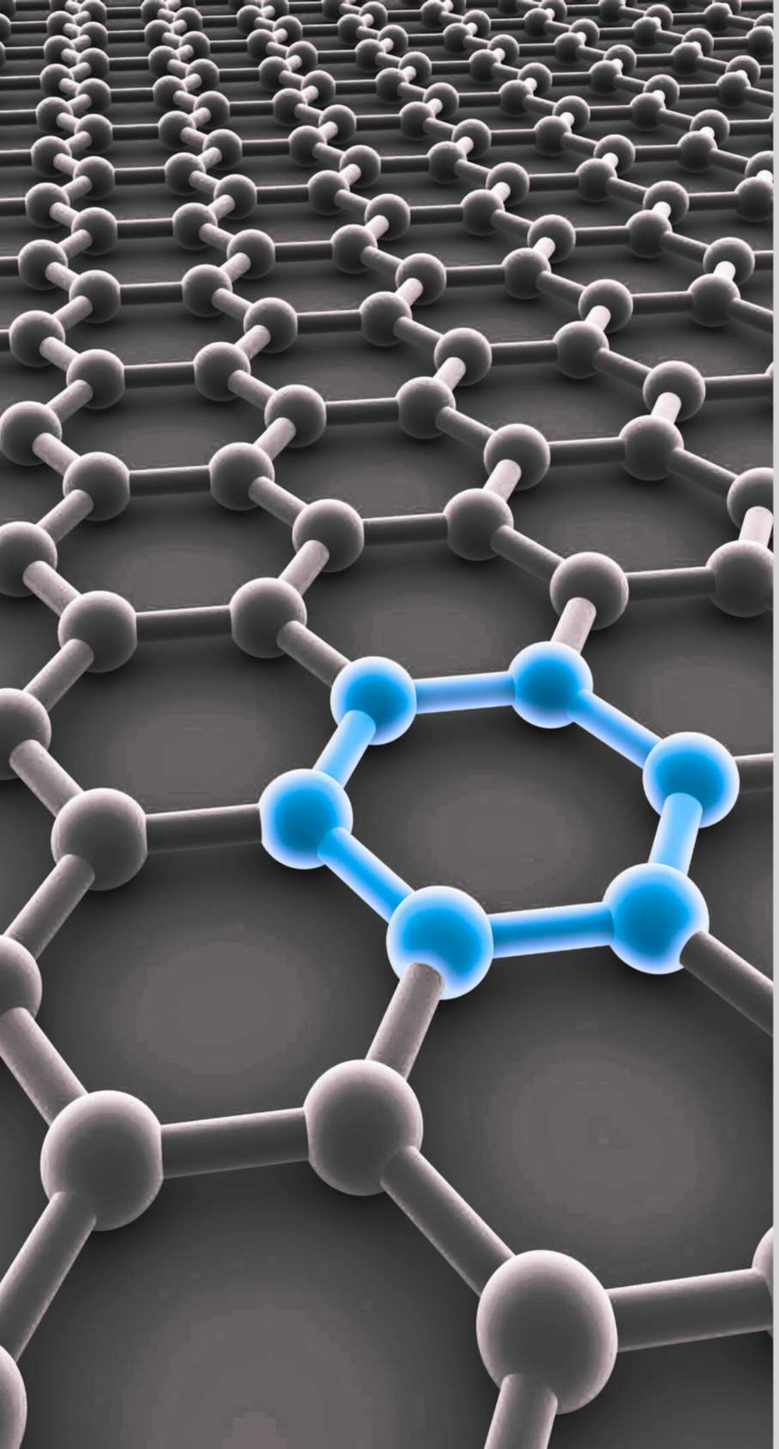
powder Solution



Nava Graphena™

The exceptional combination of chemicals with premium graphene offers the following benefits:

- Enhance durability & versatility; makes textiles **stronger and more flexible** than ever.
- Graphene provides exceptional **tensile strength**, ideal for durable textiles.
- Enhanced Flexibility. The flexibility of graphene allows for **comfort and movement** in clothing.
- Lightweight Comfort, offer **superior breathability** while keeping you comfortable during activities.



Nava Graphena™

- To enhance **strength**, **conductivity,** and **flexibility**, elevate the functionality of textiles.
- To offer **UV protection** by effectively absorbing and blocking harmful ultraviolet rays, thus safeguarding the skin.
- To offer **the antimicrobial** properties, help to creating anti-bacterial fabrics, reducing the risk of bacterial growth and ensuring hygiene.
- The **anti-static** nature of graphene prevents the buildup of static electricity, making garments more comfortable to wear.
- Excellent **thermal conductivity** in regulate temperature, providing thermal control by dissipating heat rapidly and keeping the wearer **cool** in hot conditions and **warm** in cold environments.

These advanced properties open up new possibilities for smart clothing, protective gear, and other innovative textile applications.

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Product Line

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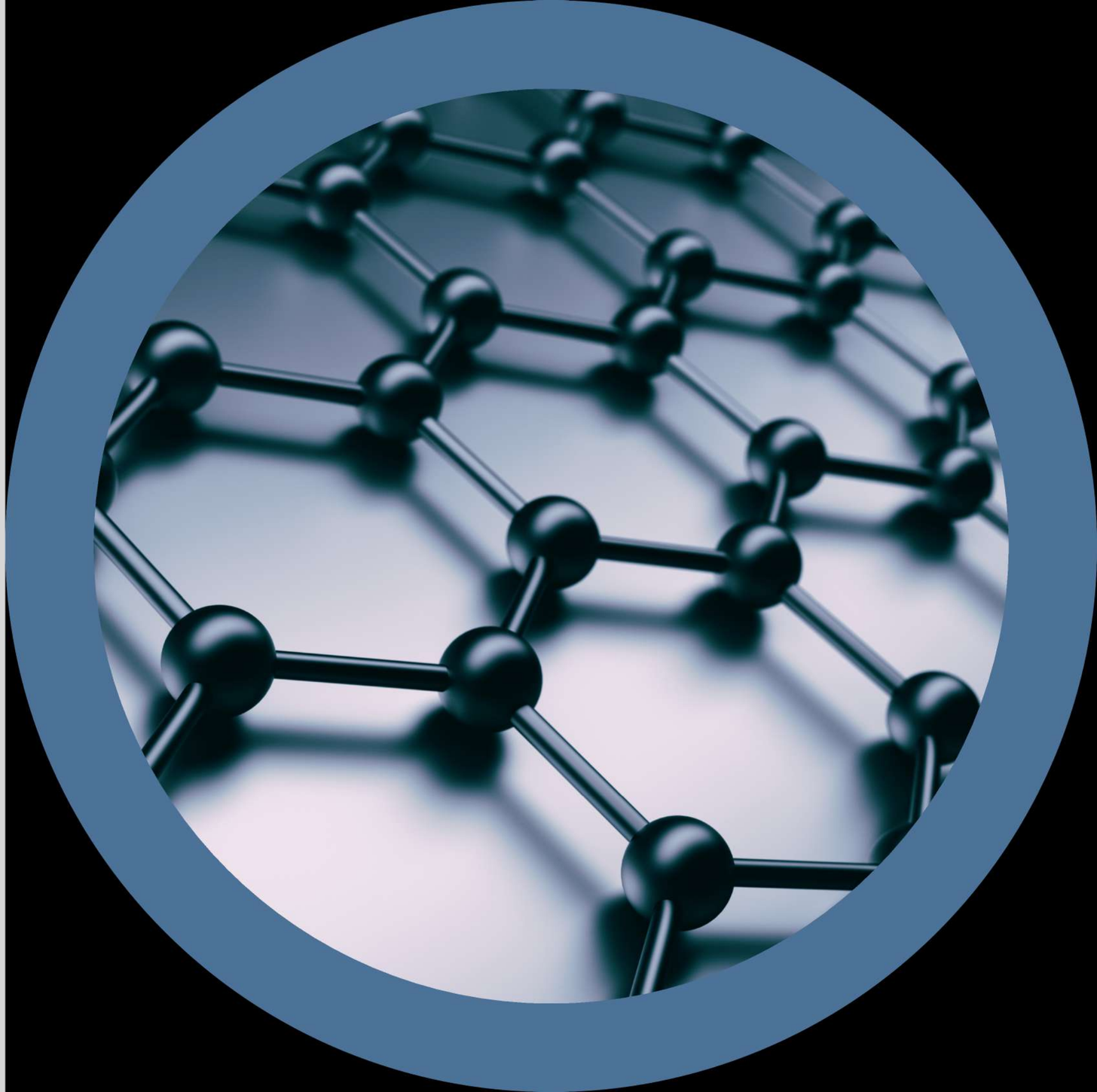

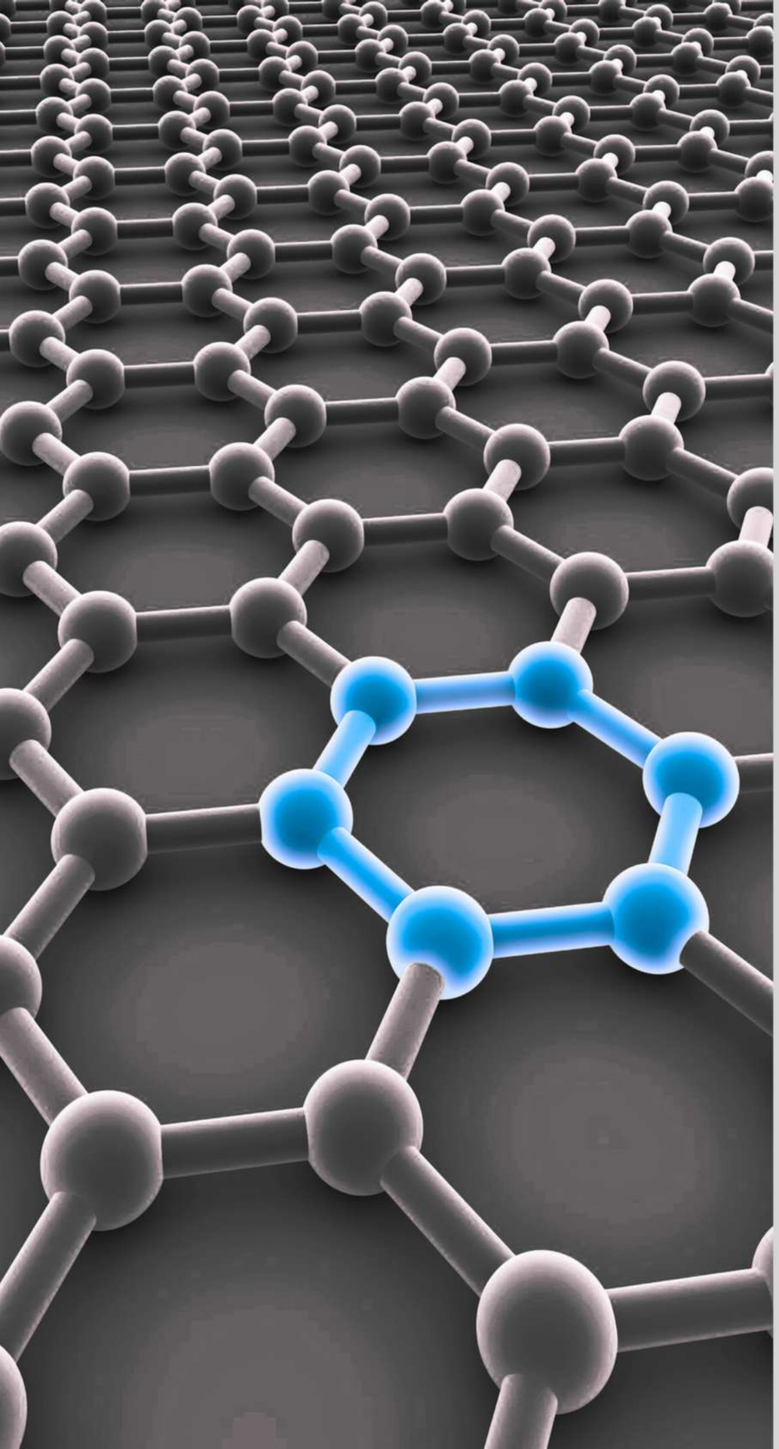

Nava Graphena™

Product’s series

1. **Nava Graphena Repel**
   - Water repellent without fluorocarbons.
2. **Nava Graphena Cool**
   - Features Menthol Cool Mode for added comfort.
3. **Nava Graphena MM**
   - Offers moisture management and quick-dry capabilities with a high evaporation rate and temperature control.
4. **Nava Graphena Coat**
   - Coating options include PU/Acrylic/Silicone-based or water-based, tailored for various applications such as breathable, windproof, or waterproof.

All plus Basic function of Graphene; Anti-Bacteria , UV-Protection, Anti-Static.

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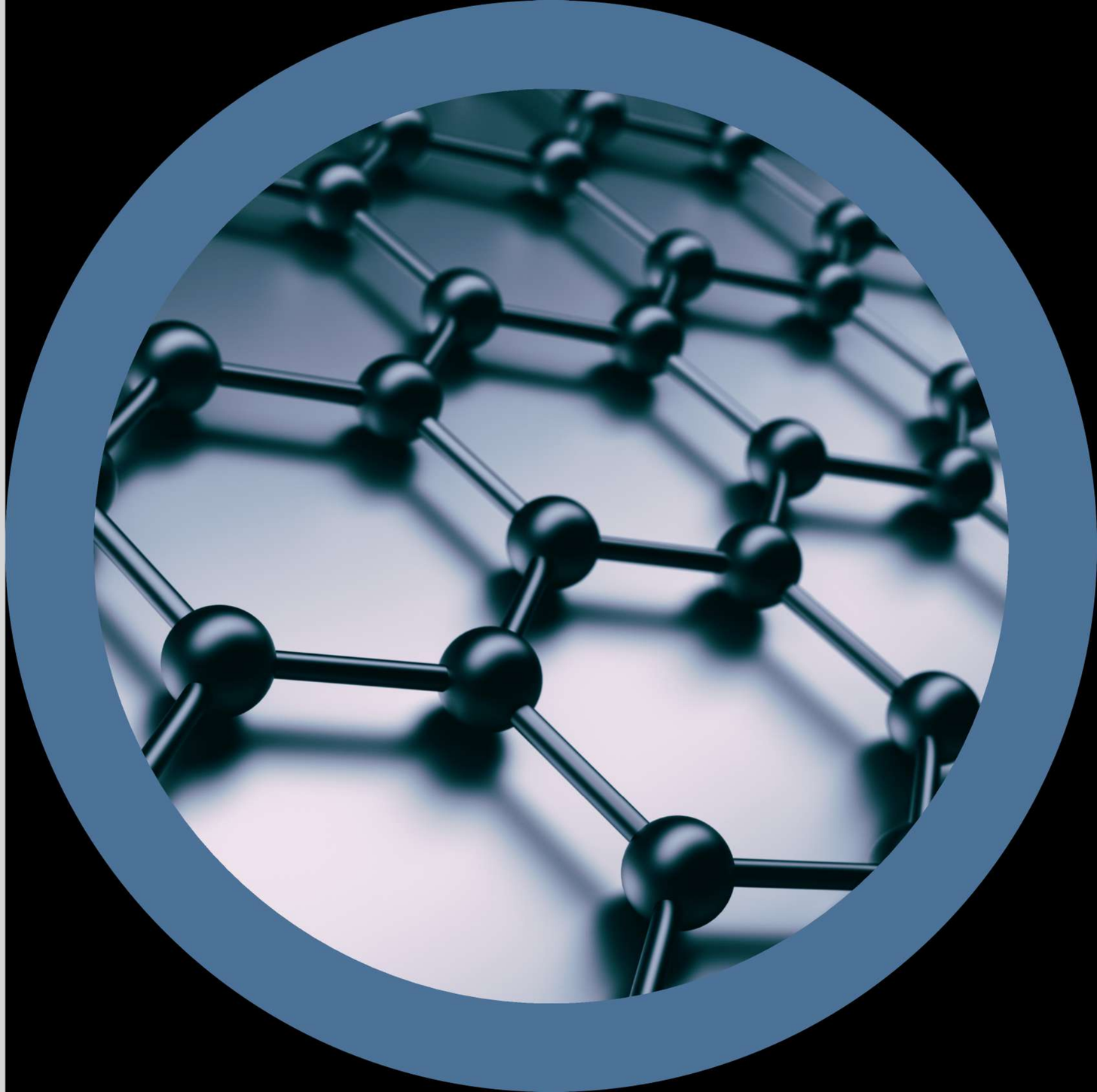
Nava Graphena™

Repel

Superior Non-Fluoro Carbon-Based Water Repellent for Textiles



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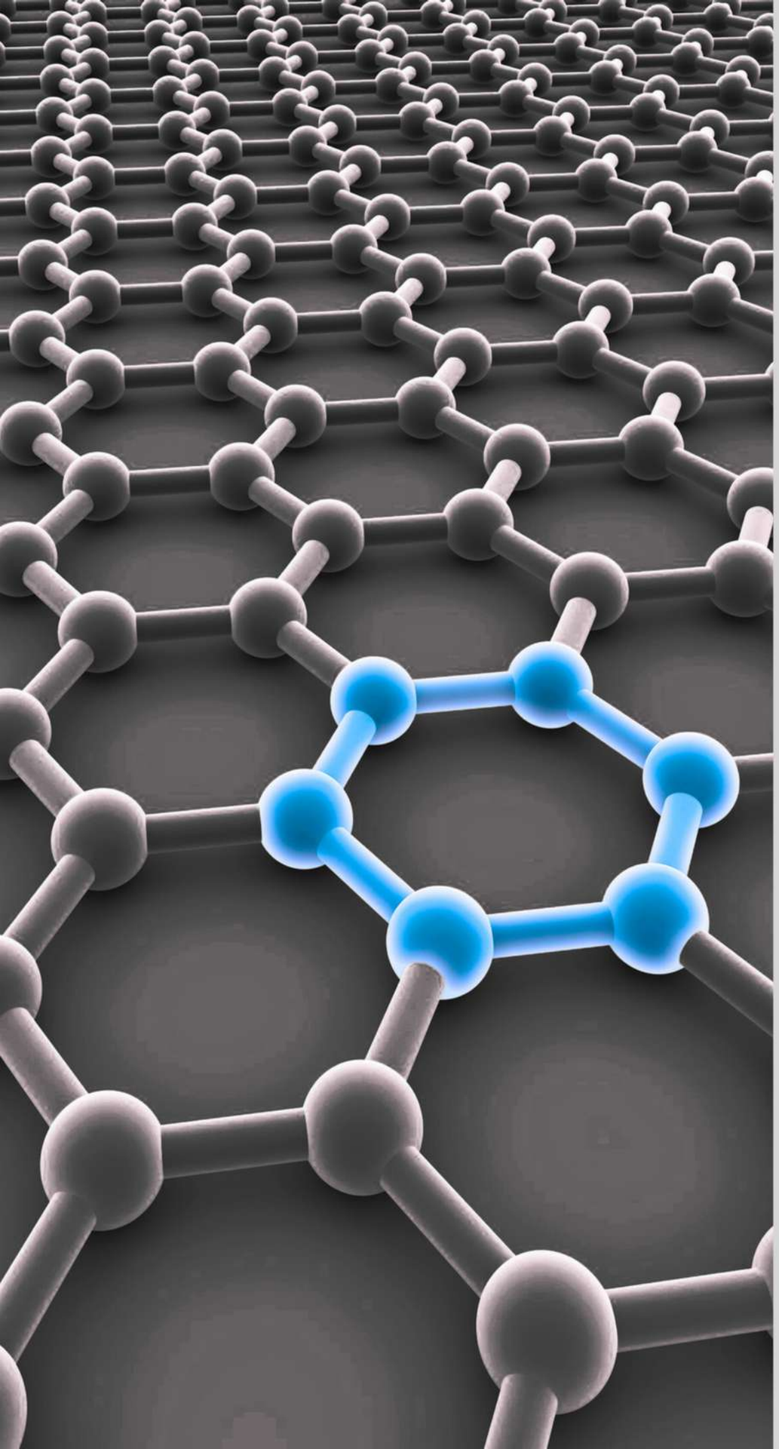


Nava Graphena™ Repel

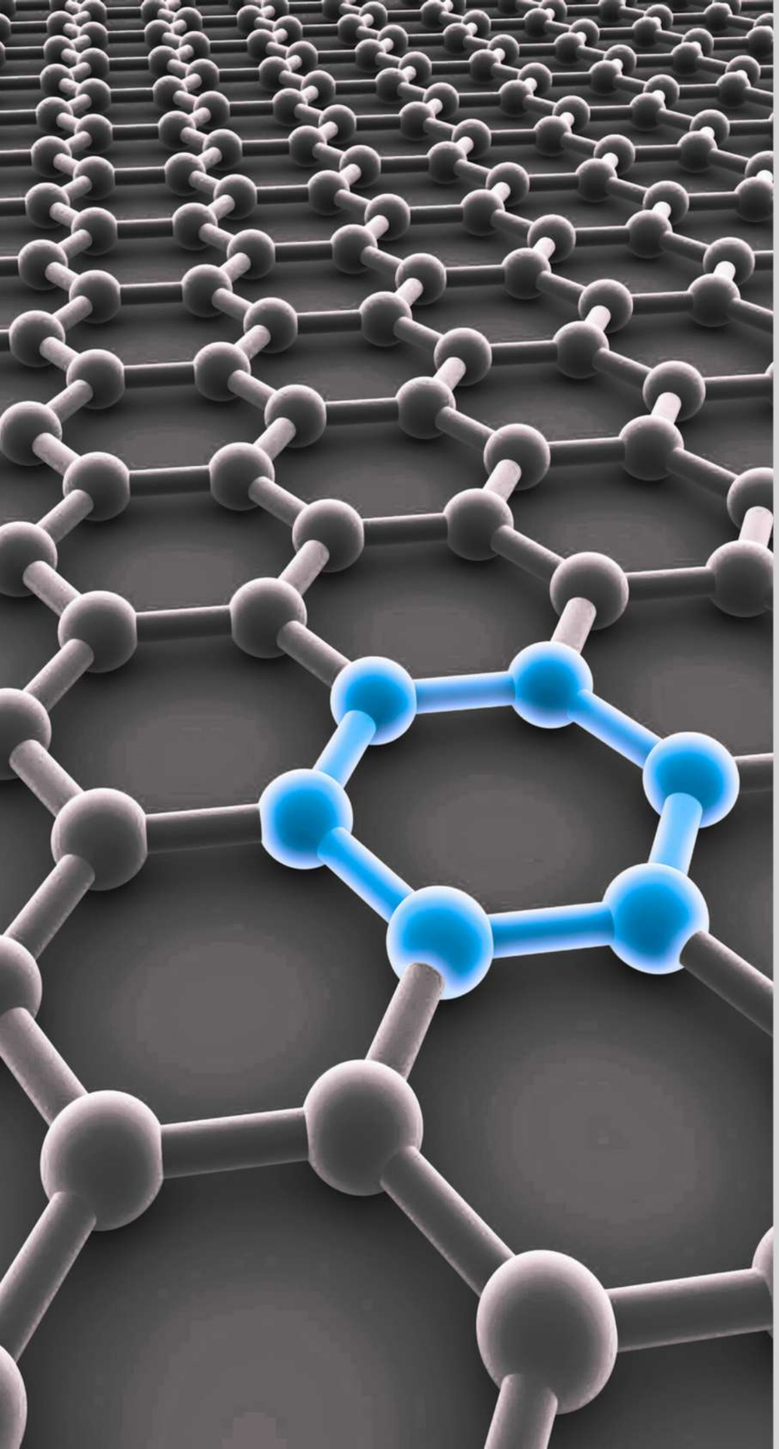
Non- Fluorocarbon based Repellency and Resilience for Textiles, Nonwovens, and Carpets

Main Function

- **Water repellent, featuring resilience and durability.**

Addition Functions of Graphene

- Anti-Bacterial: Graphene exhibits properties that help inhibit bacterial growth.
- UV Protection: It provides a barrier against harmful ultraviolet rays.
- Anti-Static: Graphene helps in reducing static electricity.



Nava Graphena™ Repel

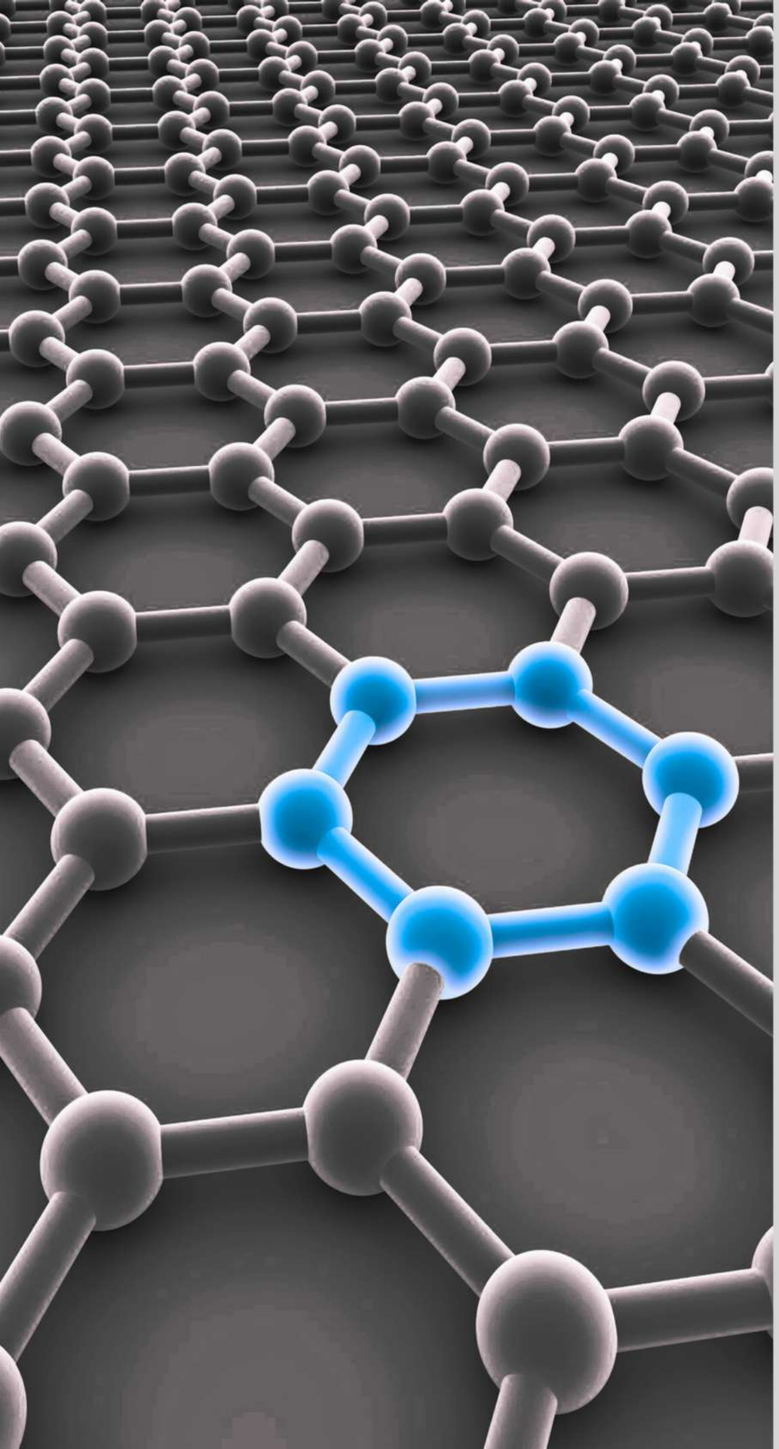
Non- Fluorocarbon based Repellency and Resilience for Textiles, Nonwovens, and Carpets

General physical properties

- Off-white Emulsion
- 30% Solid content (exclude Graphene)
- pH 4.0-6.0
- Cationic
- Ready to soluble with water

Application

- Suitable for all Synthetic Fiber.

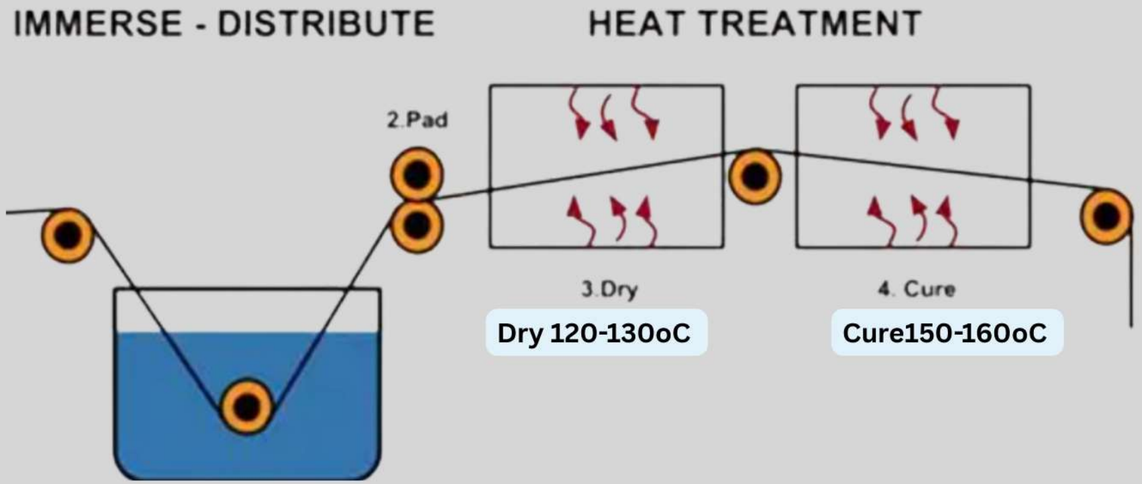


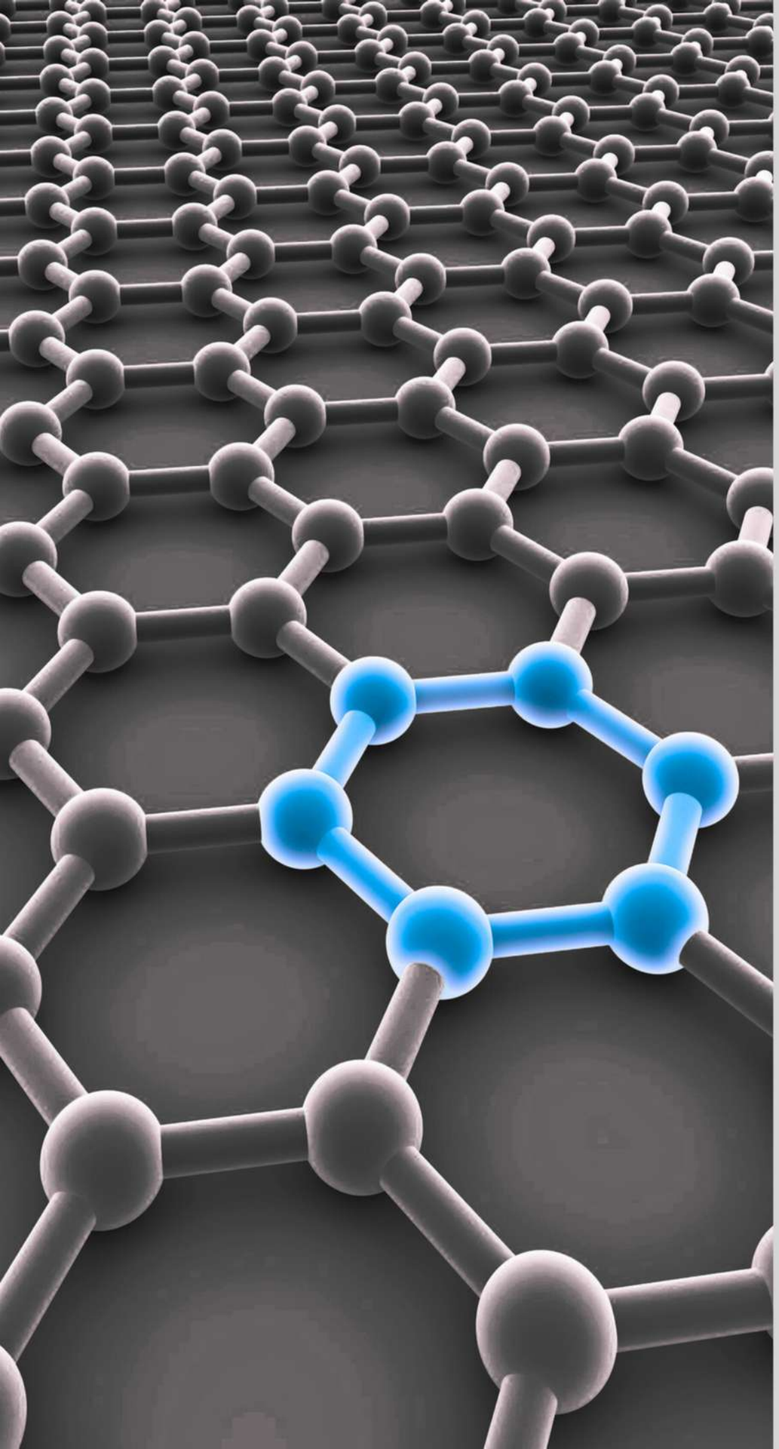
Nava Graphena™ Repel

Non- Fluorocarbon based Repellency and Resilience durable for Textiles, Nonwovens, and Carpets

Process application

- Dosage 10-30 g/l
- pH adjust bath 5.0-5.5





Nava Graphena™ Repel

Non- Fluorocarbon based Repellency and Resilience durable for Textiles, Nonwovens, and Carpets

Application

- Outdoor
- Casual suit
- Sportwear
- Furniture
- interlining
- etc.

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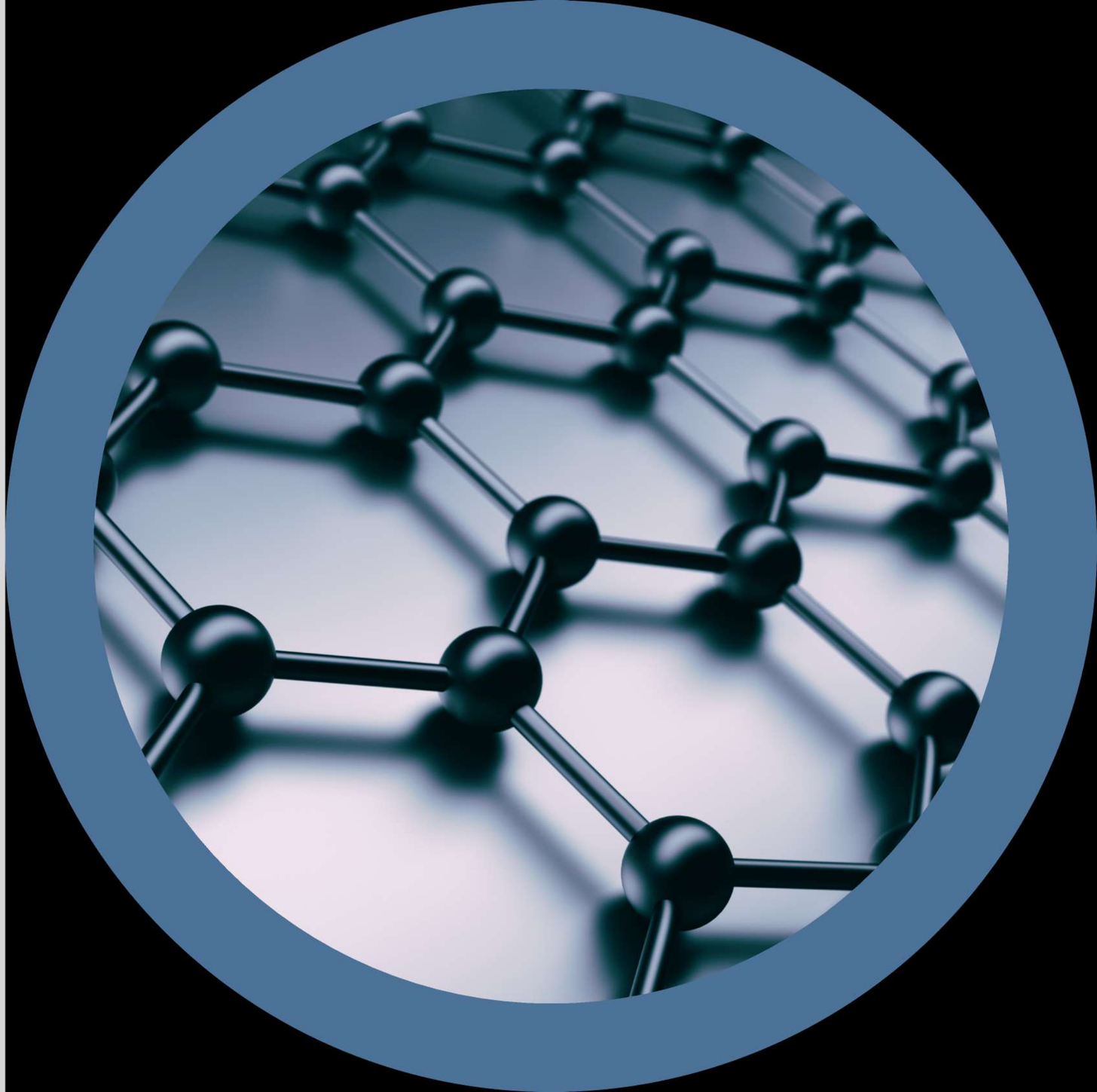
Cool

A Menthol Cool Mode for enhanced comfort.



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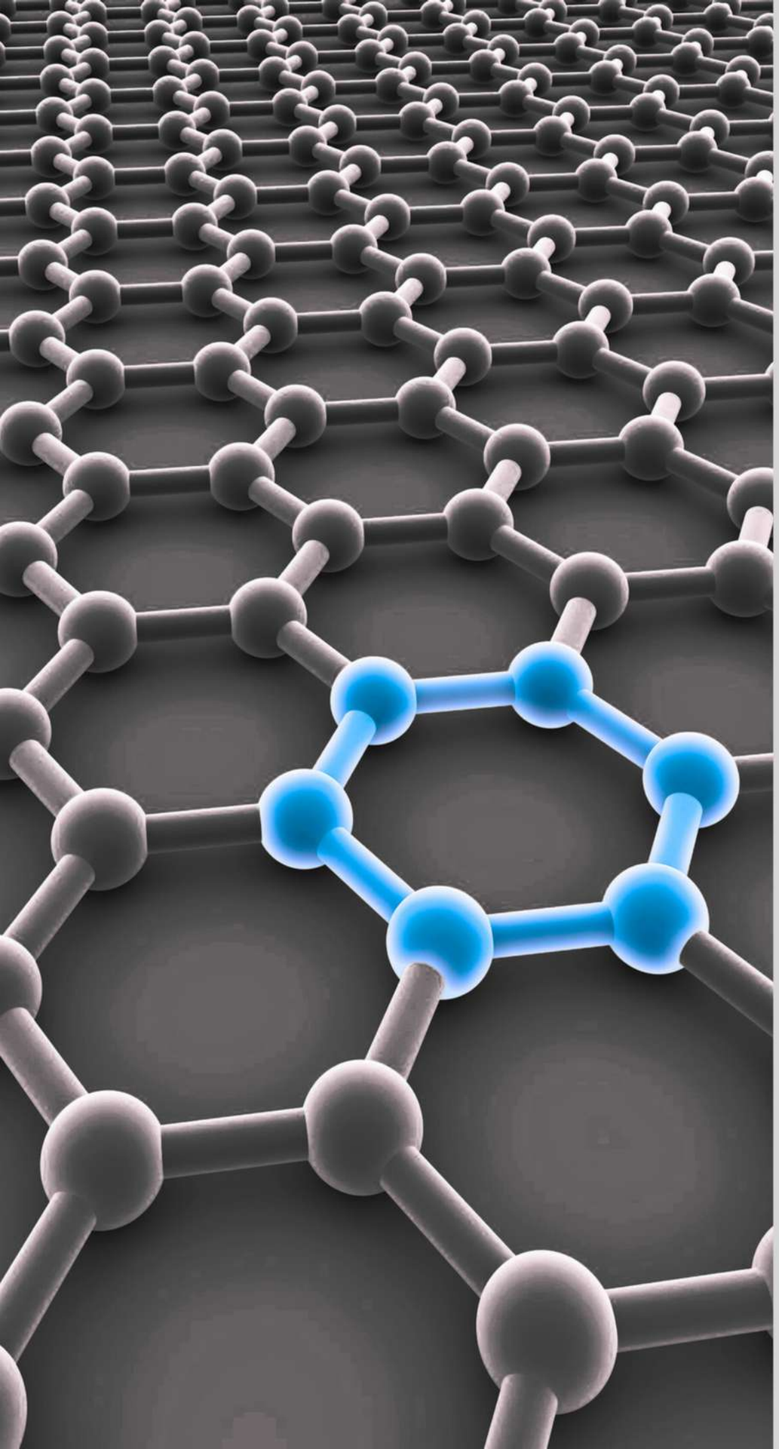


Nava Graphena™ Cool

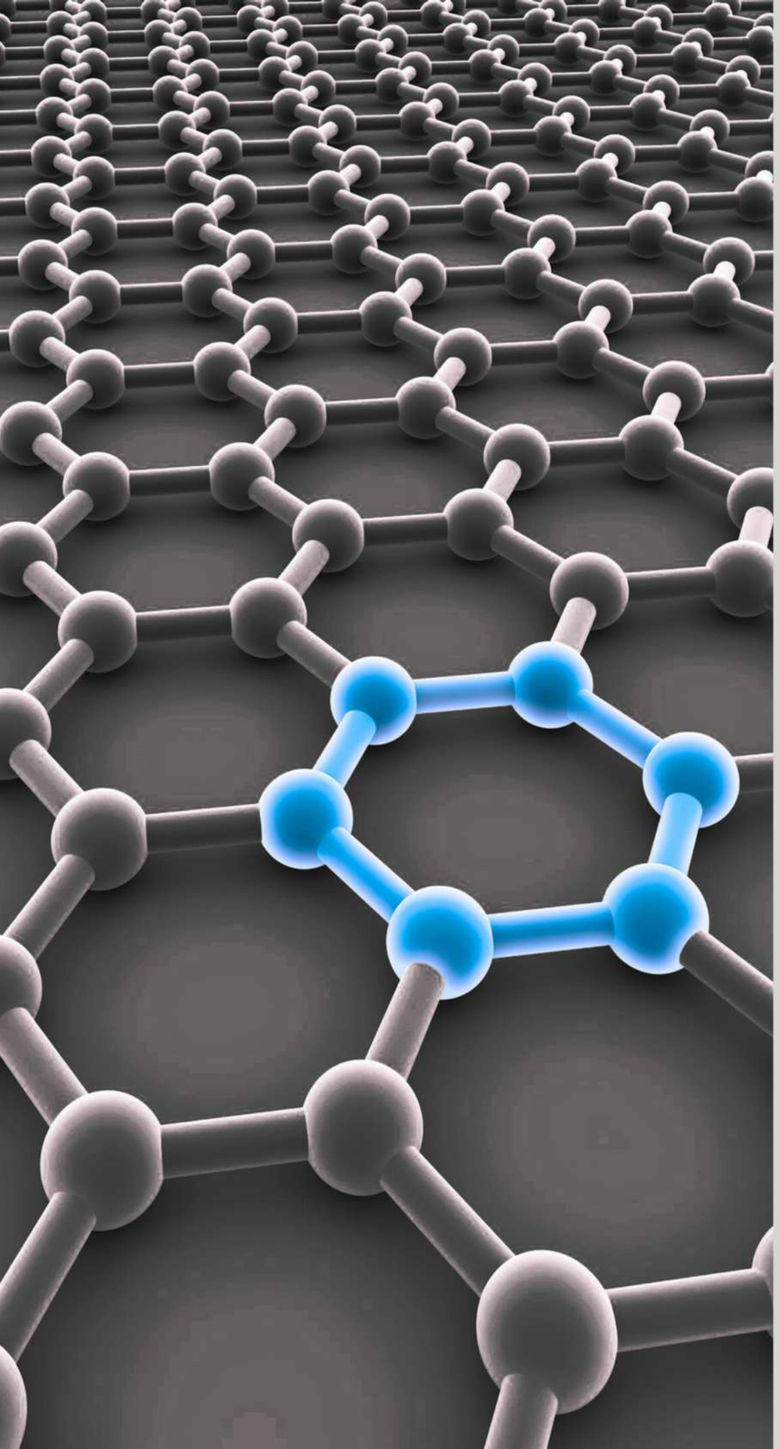
A thermal comfort finish uses natural properties, with menthol as a cooling agent and a moisture-responsive polymer that boosts the body's natural air conditioning abilities.

Main Function

- **Engaging mode that provides a long-lasting evaporative cooling effect with low effect with color fastness.**

Addition Functions of Graphene

- Anti-Bacterial: Graphene exhibits properties that help inhibit bacterial growth.
- UV Protection: It provides a barrier against harmful ultraviolet rays.
- Anti-Static: Graphene helps in reducing static electricity.



Nava Graphena™ Cool

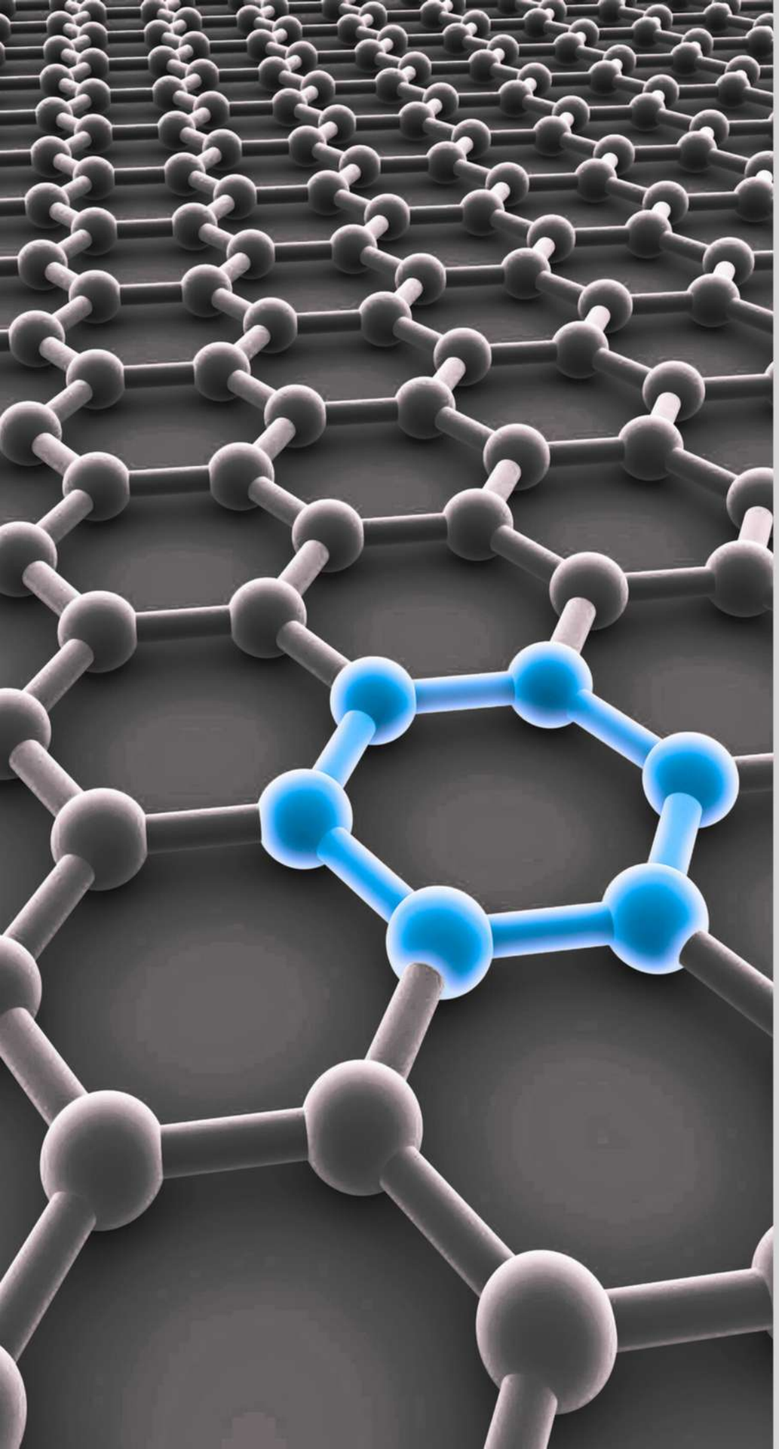
Menthol serves as a natural cooling agent, enhancing comfort.

General physical properties

- Grey-beige Emulsion
- Specific gravity at 20 °C approx. 1.0 g/cm³
- pH 4.0-5.5
- Non-Ionic
- Ready to soluble with water

Application

- Suitable for all Synthetic Fiber, especially Polyester.

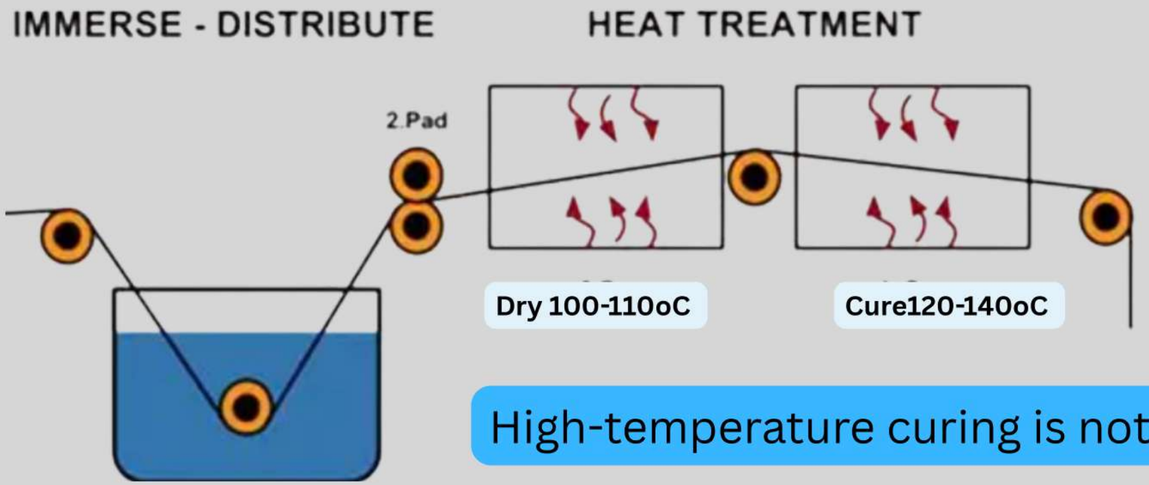


Nava Graphena™ Cool

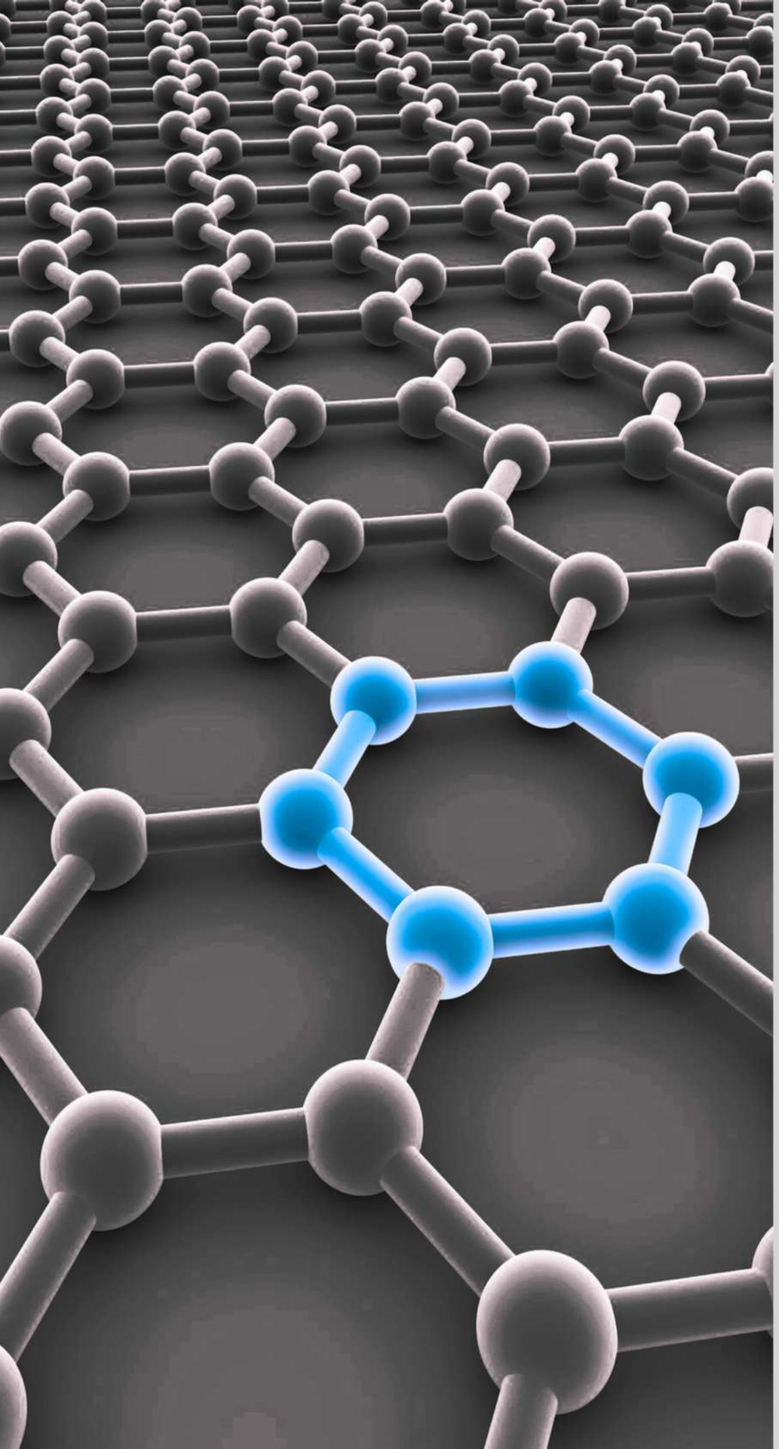
Menthol serves as a natural cooling agent, enhancing comfort.

Process application

- **Dosage 20-80 g/l (based on type and fabric structure)**
- **pH adjust bath 6.0-6.5**



High-temperature curing is not necessary.



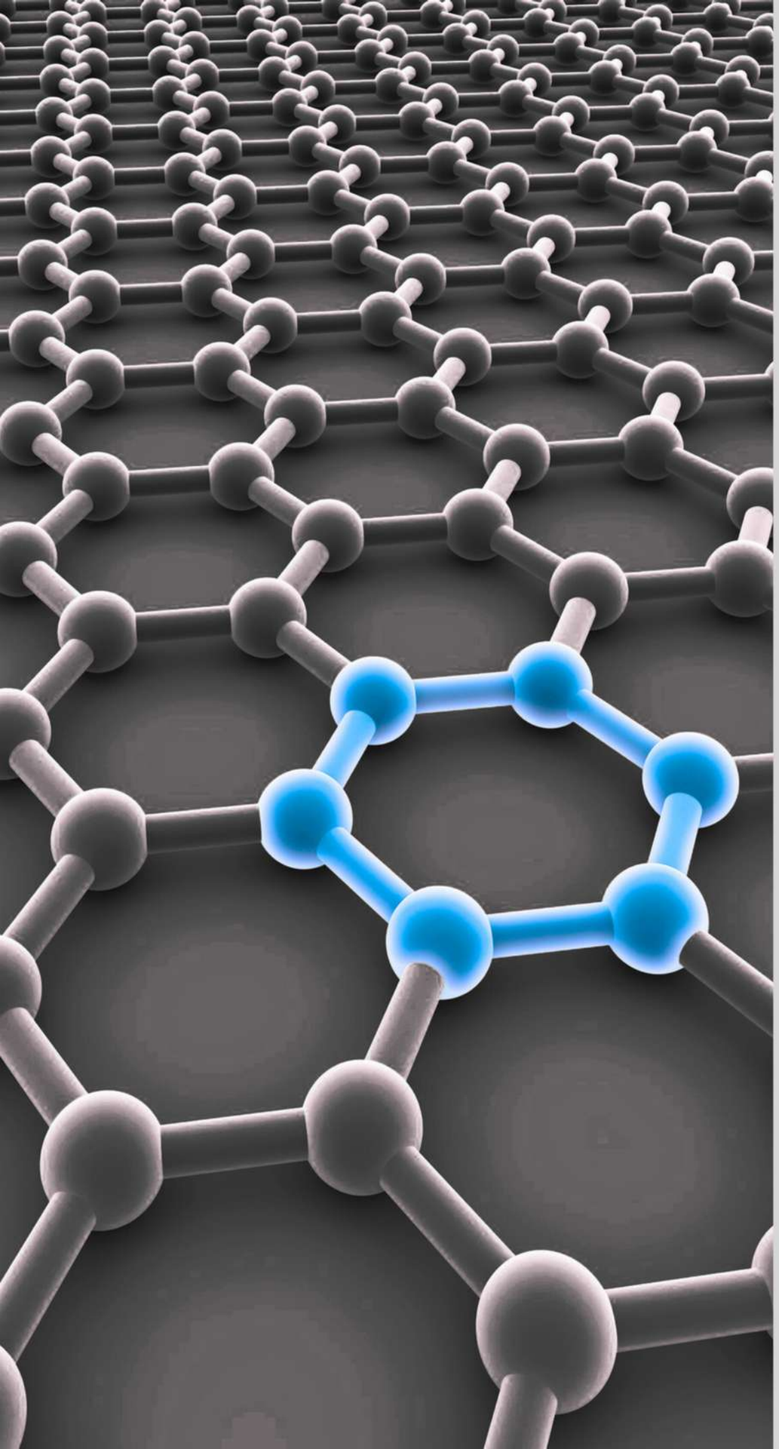
Nava Graphena™ Cool

Menthol serves as a natural cooling agent, enhancing comfort.

Additional information

- Applications can be made by spraying the material in aerosol form, but this poses health risks. Spray only in enclosed spaces with proper ventilation and avoid inhaling aerosols.
- For better cooling and evaporation, use a hydrophilic agent like **Nava Graphena MM** (recommended dosage: 20-50 g/l) when moisture is present.

Cool + Soft + dry = comfortable



Nava Graphena™ Cool

Menthol serves as a natural cooling agent, enhancing comfort.

Application

- Athletic
- Sportwear
- Casual wear
- Underwear
- Scarf
- Buff (multifunction headwear)
- Arm sleeve

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MM

Effective Moisture Management Quick-drying features with a high evaporation rate, Temperature control for optimal comfort

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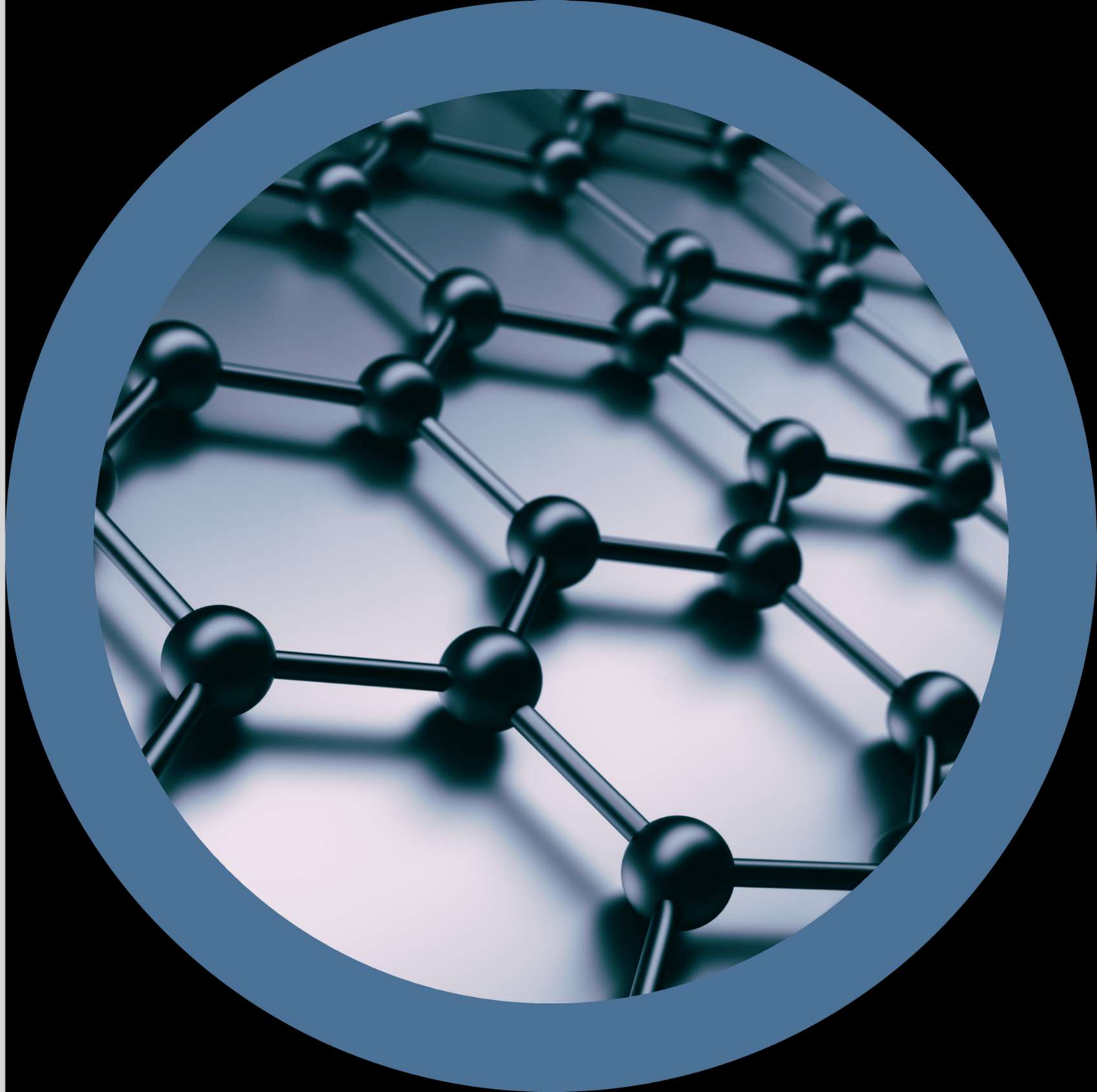
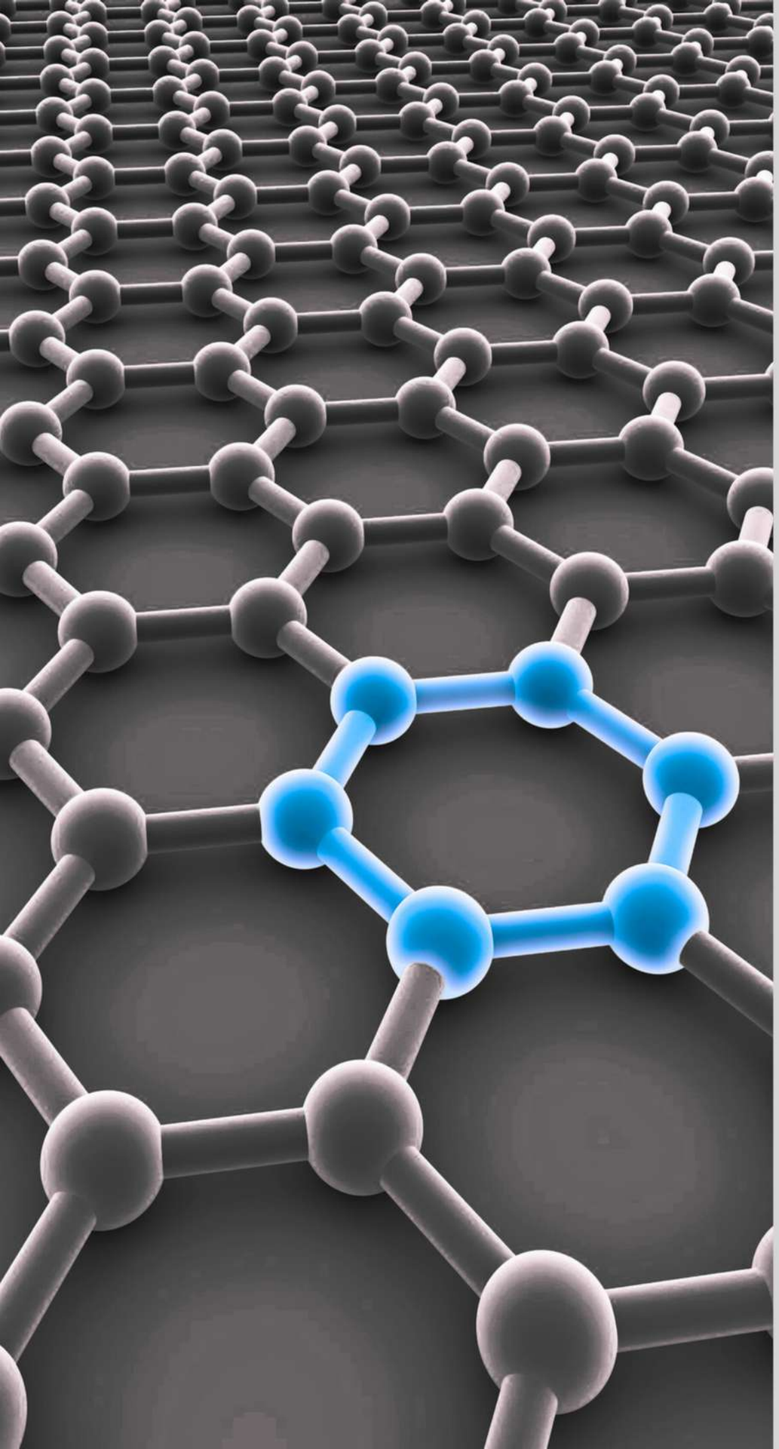




Nava Graphena™ MM

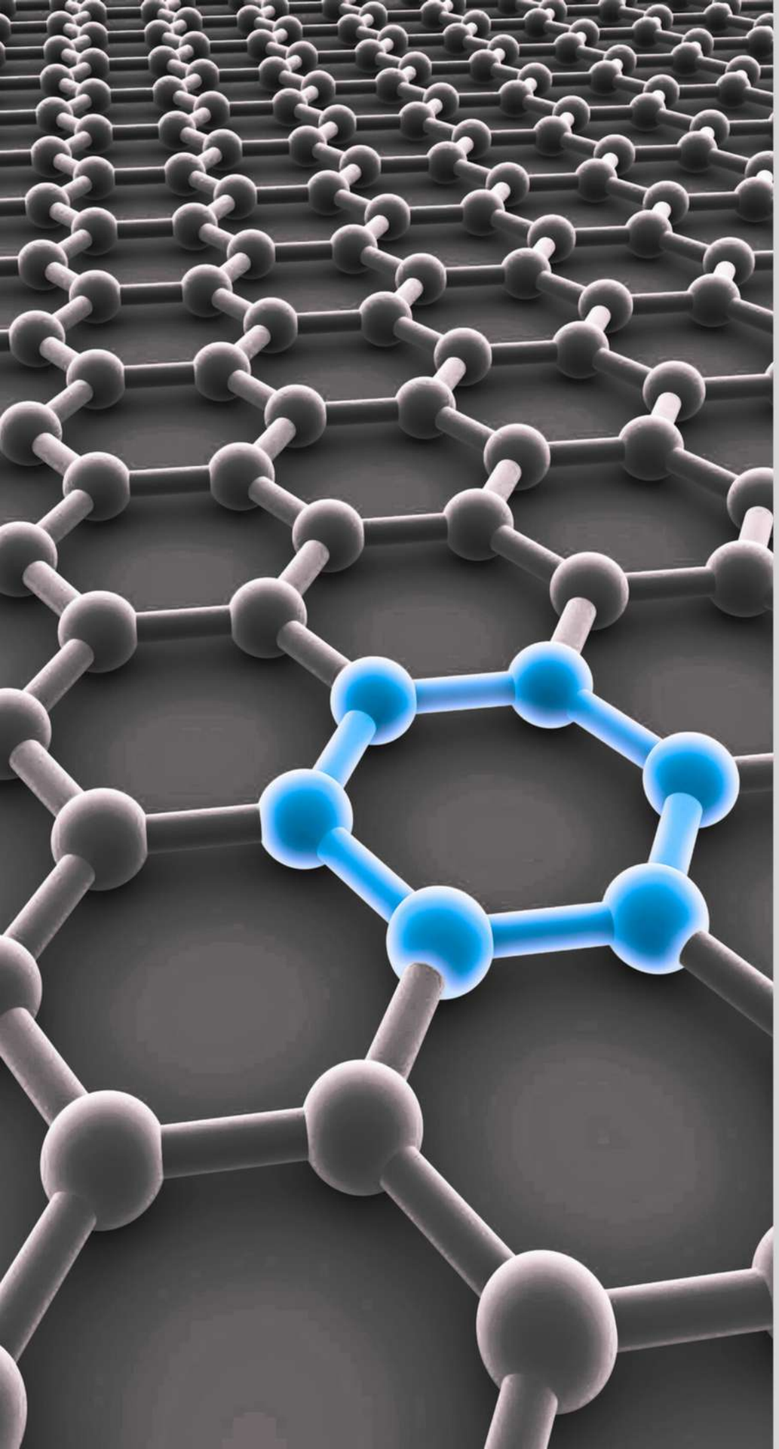
Effective Moisture Management: Quick-Drying with High Evaporation Rate and Temperature Control.

Main Function

- **Rapid drying with high comfort and elevated evaporation rate.**

Addition Functions of Graphene

- Anti-Bacterial: Graphene exhibits properties that help inhibit bacterial growth.
- UV Protection: It provides a barrier against harmful ultraviolet rays.
- Anti-Static: Graphene helps in reducing static electricity.



Nava Graphena™ MM

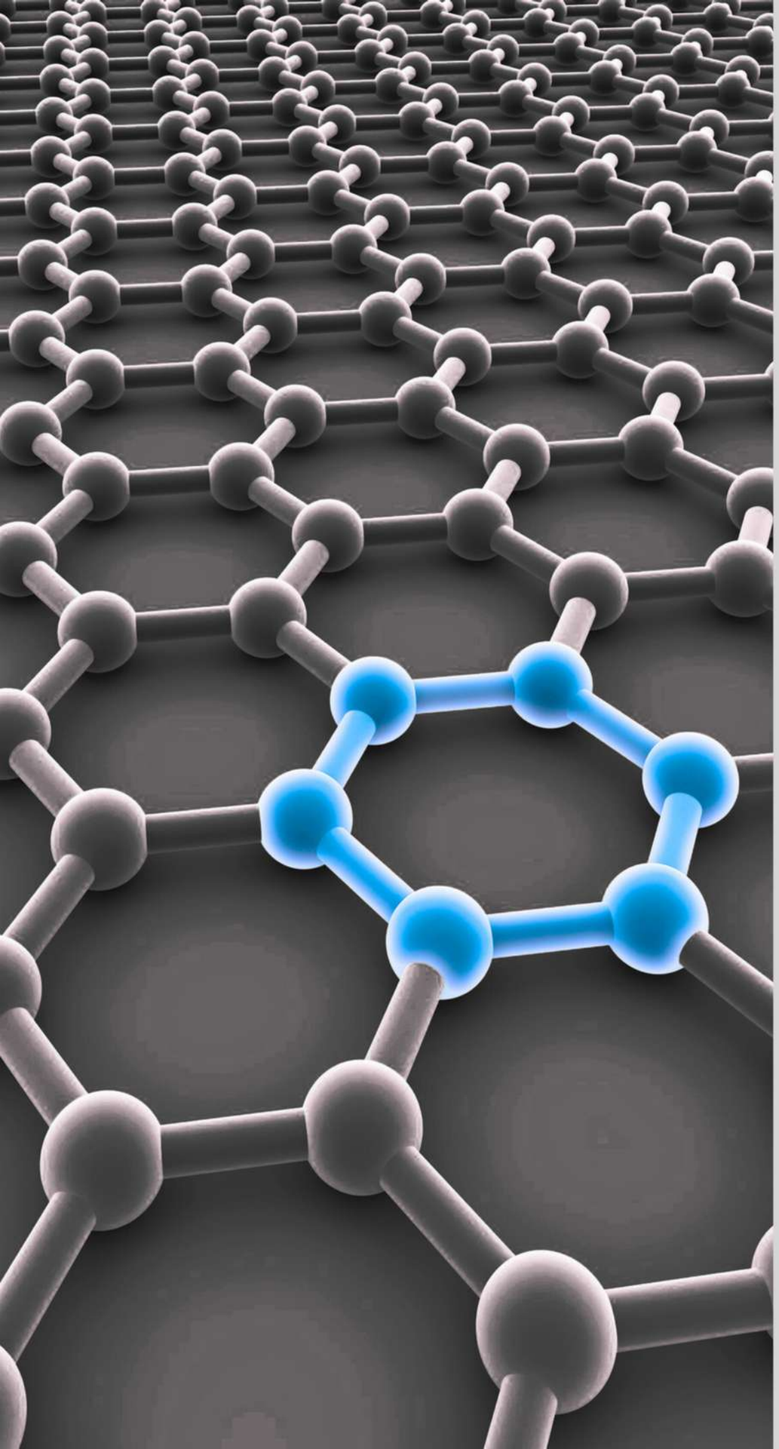
Effective Moisture Management: Quick-Drying with High Evaporation Rate and Temperature Control.

General physical properties

- Slurry liquid
- pH 6.5-7.0
- Non-ionic/An-ionic
- Ready to soluble with water

Application

- Suitable for all Synthetic Fiber, especially Polyester.

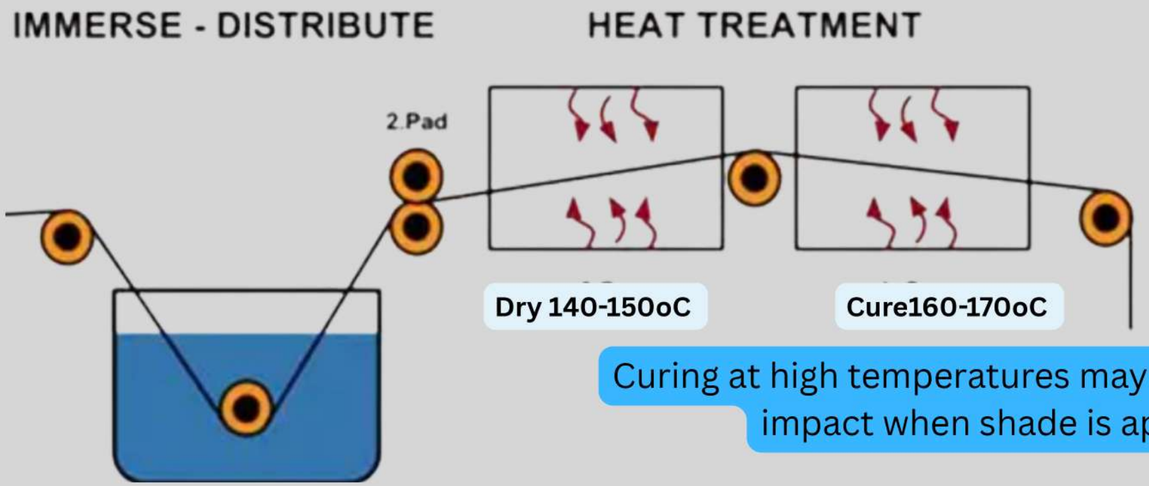


Nava Graphena™ MM

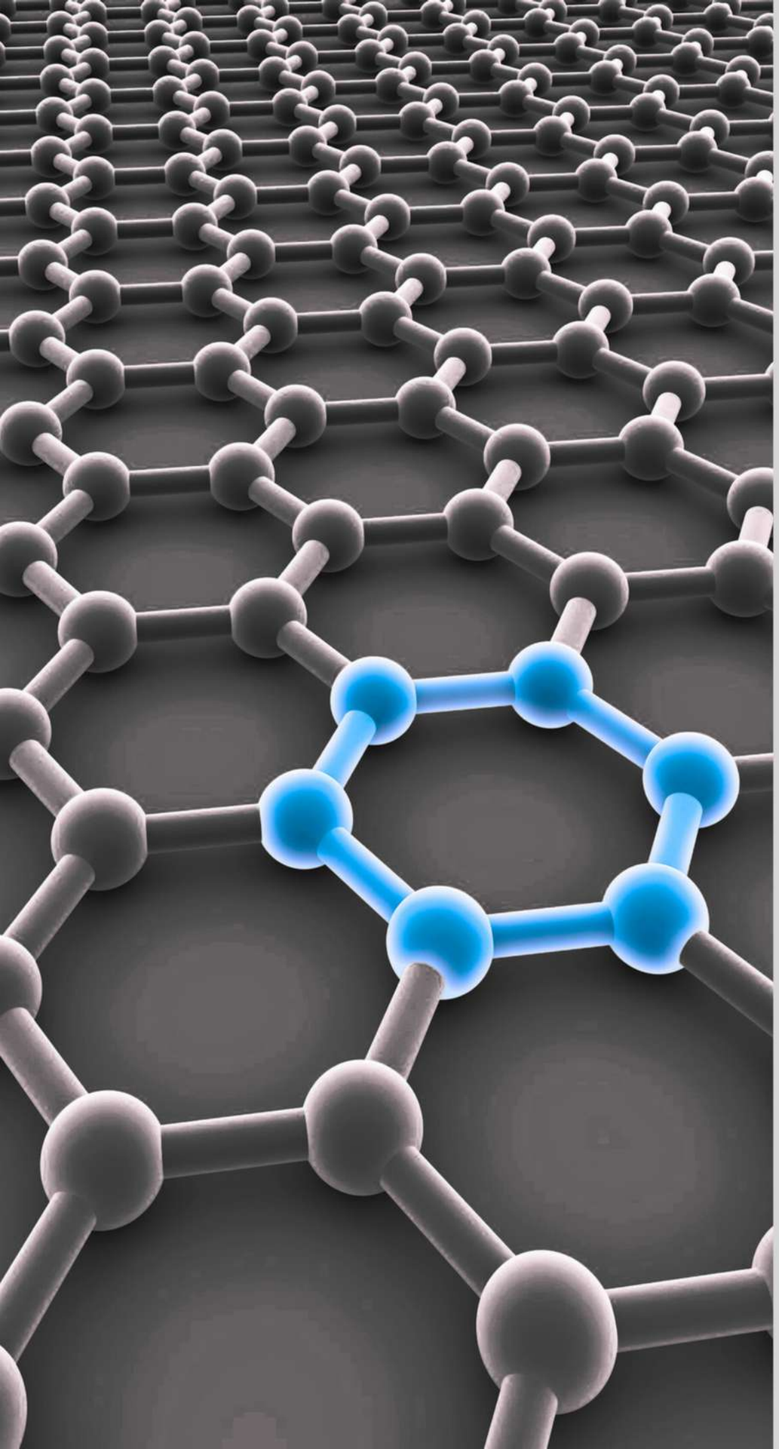
Effective Moisture Management: Quick-Drying with High Evaporation Rate and Temperature Control.

Process application

- **Dosage 20-50 g/l (based on type and fabric structure)**
- **pH adjust bath 6.0-6.5**



Curing at high temperatures may have a minimal impact when shade is applied.



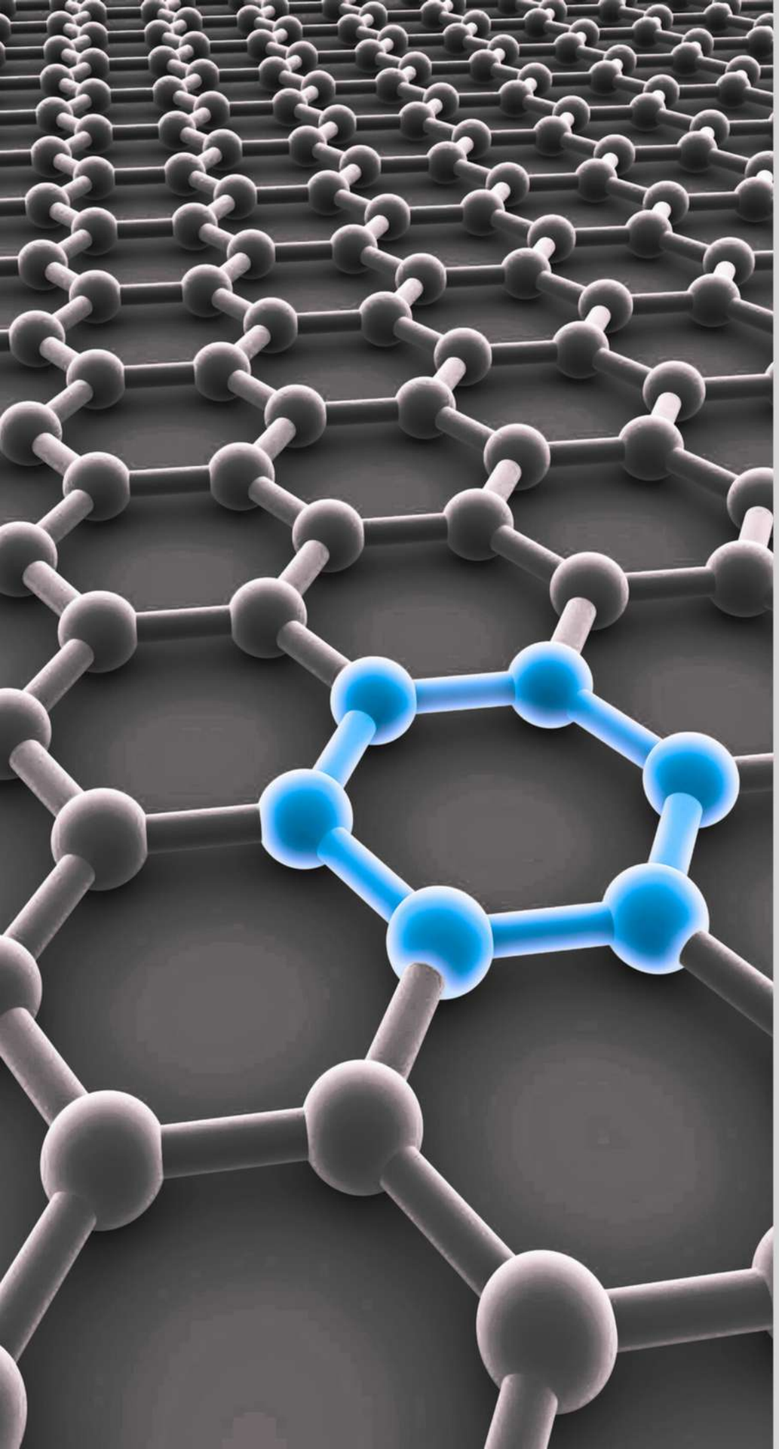
Nava Graphena™ MM

Effective Moisture Management: Quick-Drying with High Evaporation Rate and Temperature Control.

Additional information

- Can serve additional functions such as anti-crease and soil release.
- To enhance cooling and evaporation effects, it can be used with **Nava Graphena Cool**. Recommended dosage: 20-50 g/l.

Quick + Soft = comfortable



Nava Graphena™ MM

Effective Moisture Management: Quick-Drying with High Evaporation Rate and Temperature Control.

Application

- Athletic
- Sportwear
- Underwear
- Buff (multifunction headwear)
- Arm sleeve
- **etc.**

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Nava Graphena™

Coat

Integrates the advantages of coating materials with fabrics, adding distinctive characteristics that enhance the overall value of textile products.

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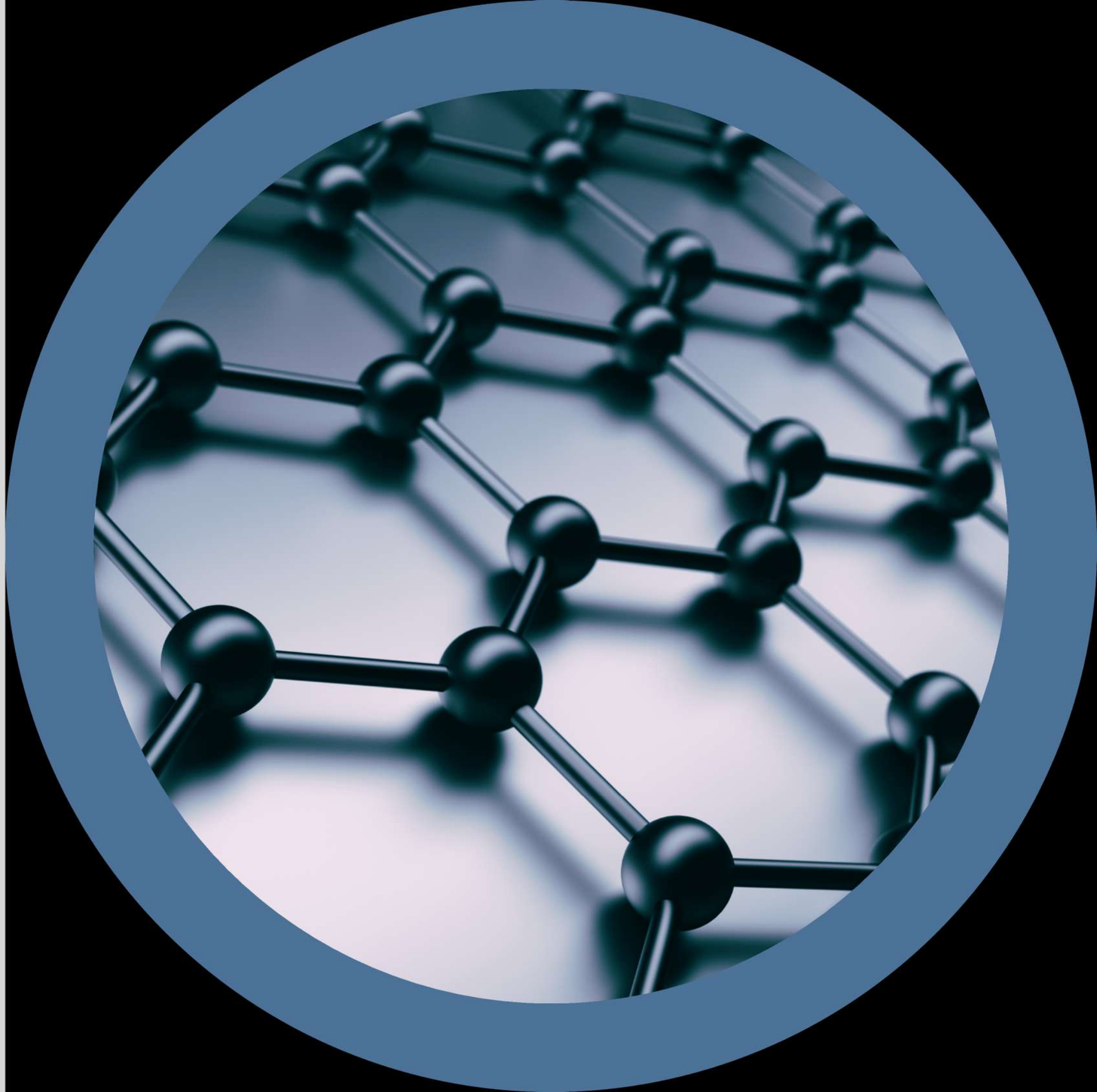
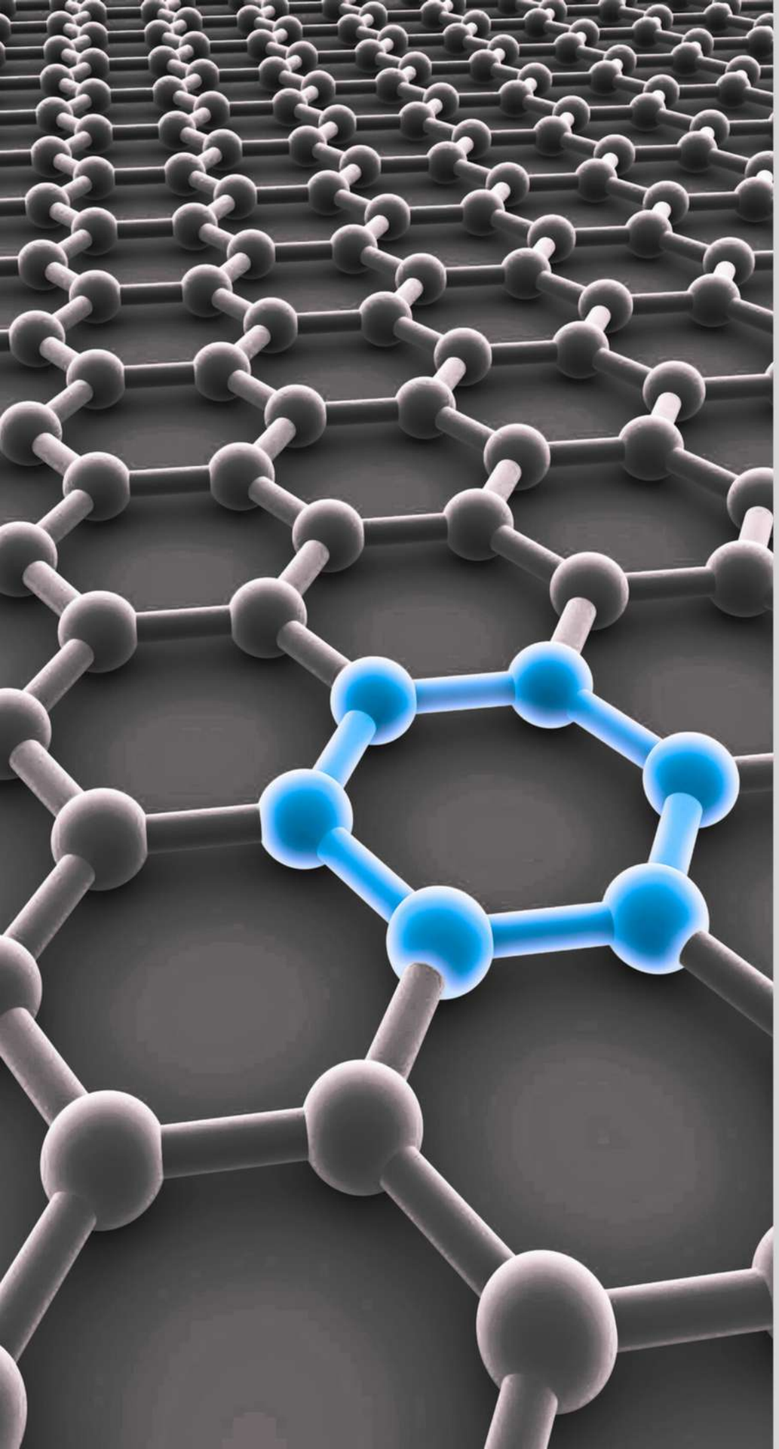


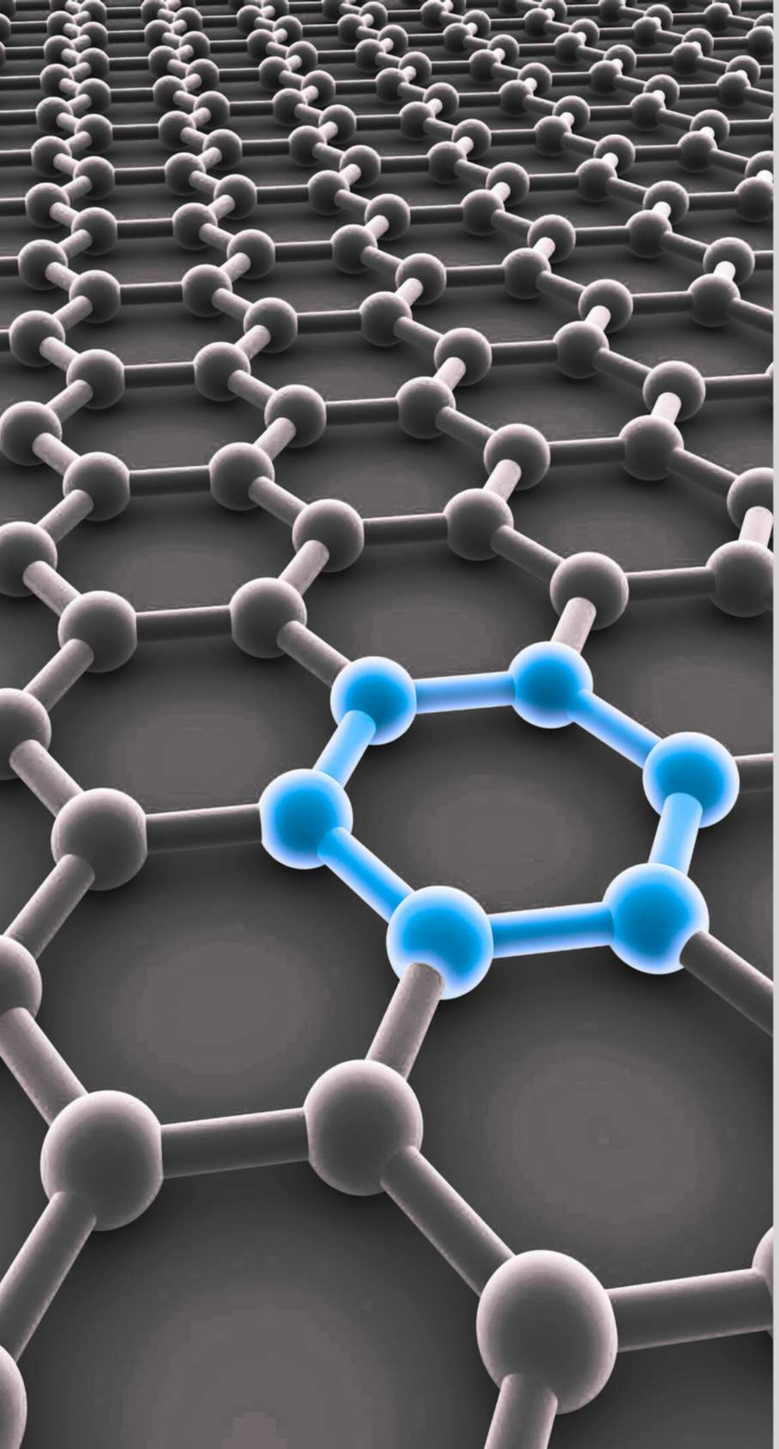


Nava Graphena™ Coat

Integrates coating materials with fabrics to enhance the value of textile products.

Performance of Coating fabric

- Waterproof, windbreak
- Fix weaving texture (no separation & easy cutting)
- Down proof
- Rubbing resistance / abrasion resistance
- Moisture permeability (breathable)
- Heat preservation / thermal insulation
- Anti-electromagnetic Resilience (recovery & wrinkle free)
- UV-cut,
- etc.

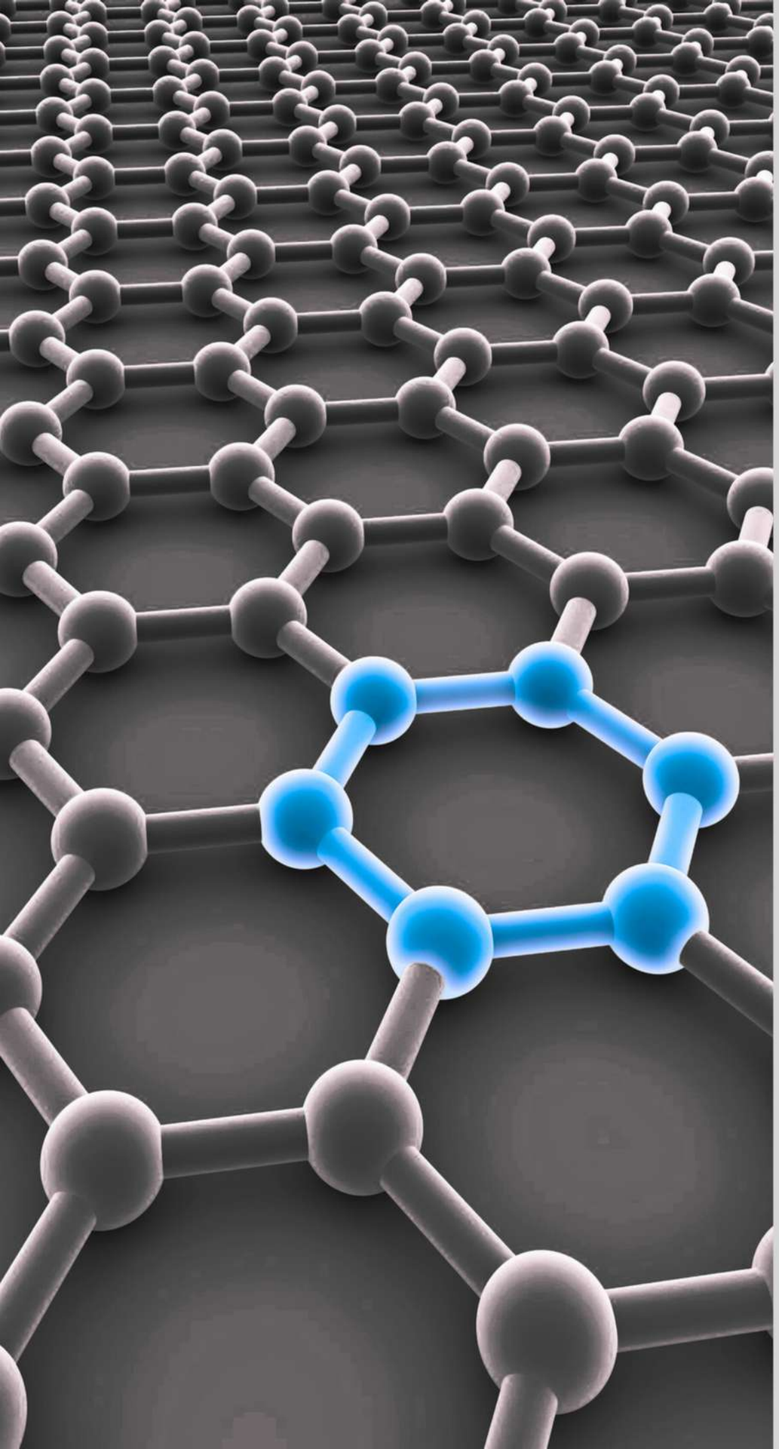


Nava Graphena™ Coat

Integrates coating materials with fabrics to enhance the value of textile products.

Special Coating

- Silver paste coating (With aluminum paste)
- Breathable Coating (Hydrophilic PU, Porous AC)
- Acrylic Coating for PU and PVC taping
- Acrylic resin composes of PU-like function
- Increasing tear strength coating
- Prevent color migration coating
- Resilience coating
- Chaps surface coating
- Fluorescent Coating



Nava Graphena™ Coat

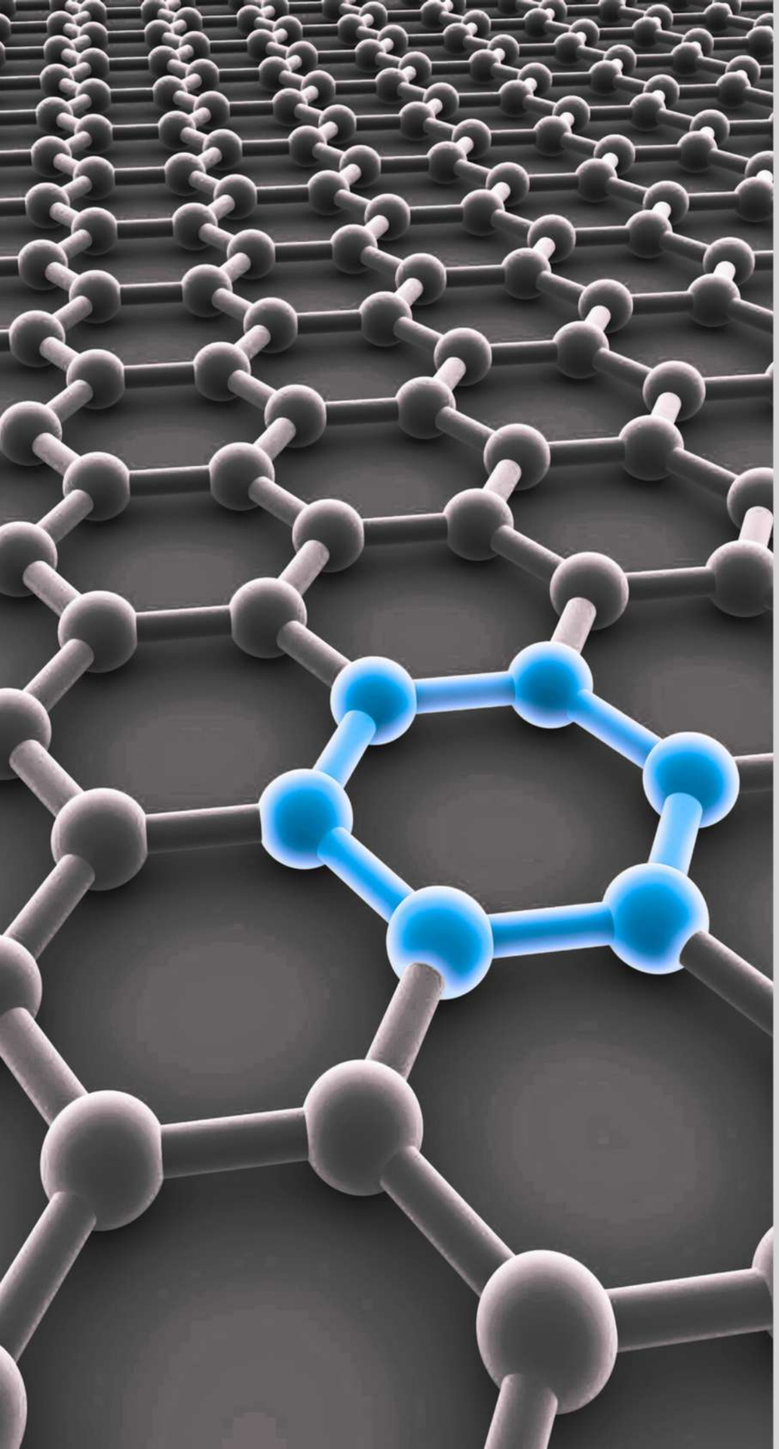
Integrates coating materials with fabrics to enhance the value of textile products.

Main Function

- **Coating capabilities to elevate the value of fabric using Acrylic, PU, and Silicone, available in both water-based and solvent-based options.**

Addition Functions of Graphene

- Anti-Bacterial: Graphene exhibits properties that help inhibit bacterial growth.
- UV Protection: It provides a barrier against harmful ultraviolet rays.
- Anti-Static: Graphene helps in reducing static electricity.

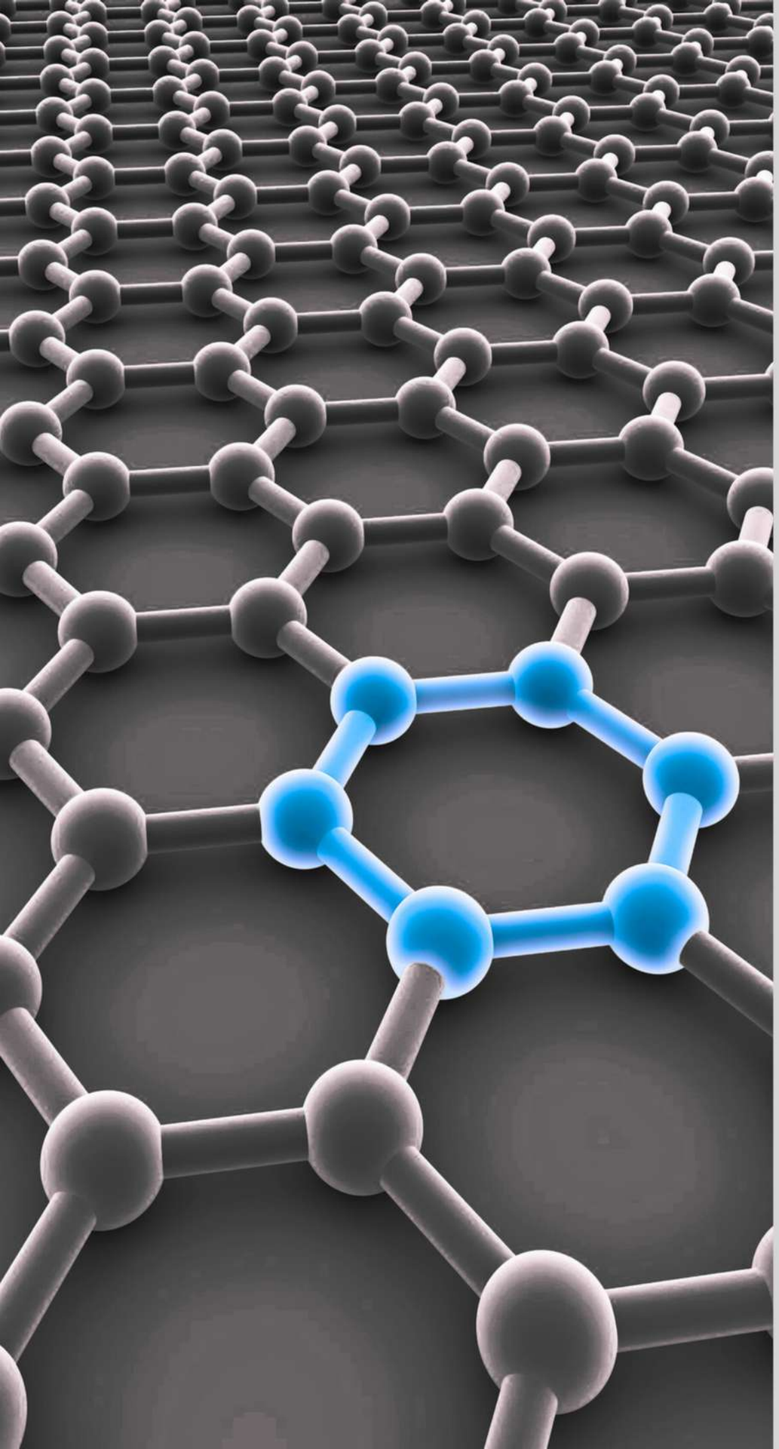


Nava Graphena™ Coat

Integrates coating materials with fabrics to enhance the value of textile products.

Knowing Resin for Coating

- **Coating resins in general**
  - **Water base** : Safety, efficiency low, energy cost high
  - **Solvent base** : Better results, save energy but risky
- **Classify coating materials into four categories**：
  - **Resin**： Acrylic, Polyurethane, ...etc.
  - **Pigment**： White, black paste, or gold, silver paste, ... etc.
  - **Auxiliary**： Matting agent, Oily or Waxy touch feel agent、Flame retardant, ...etc.
  - **Solvent**： Toluene, Methyl ethyl ketone, water, ...etc.

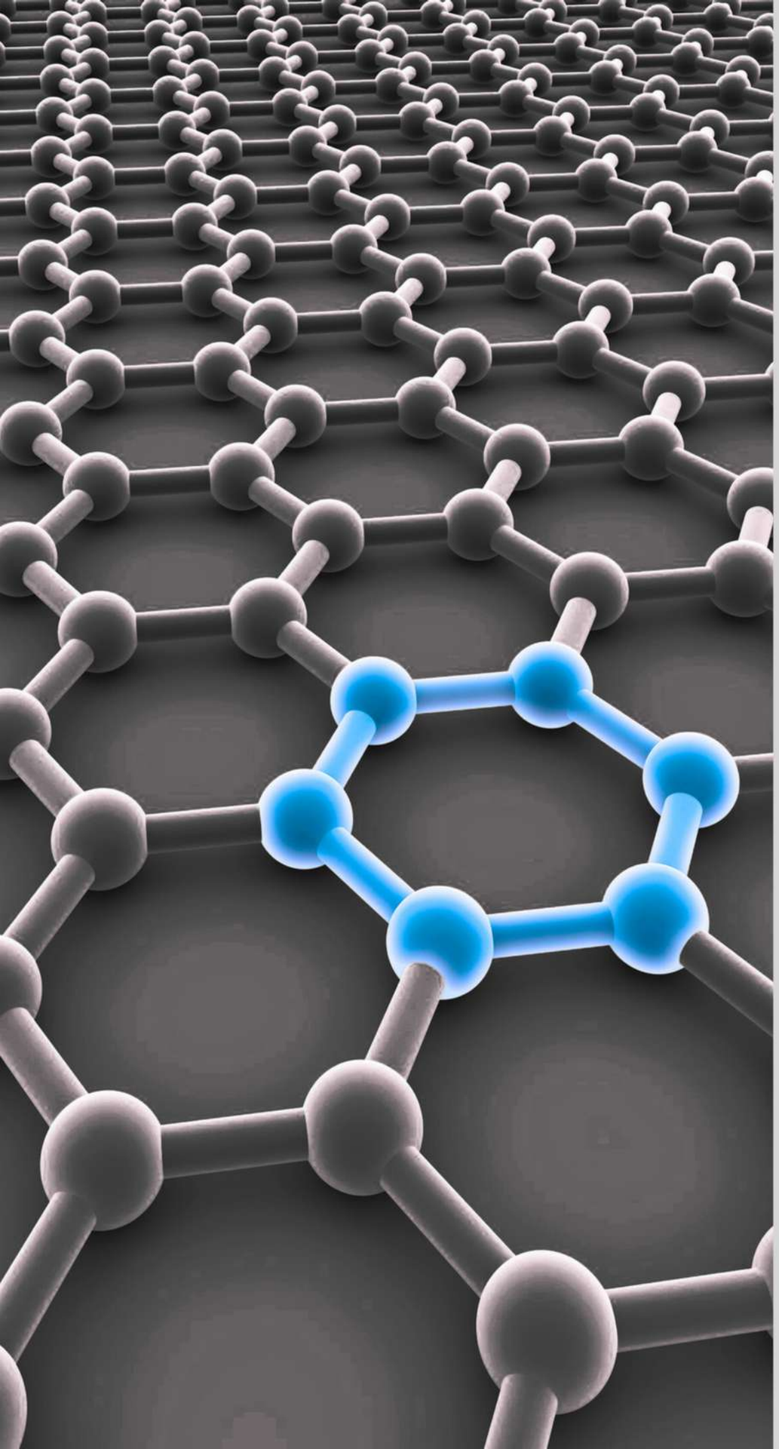


Nava Graphena™ Coat

Integrates coating materials with fabrics to enhance the value of textile products.

Type of Resin

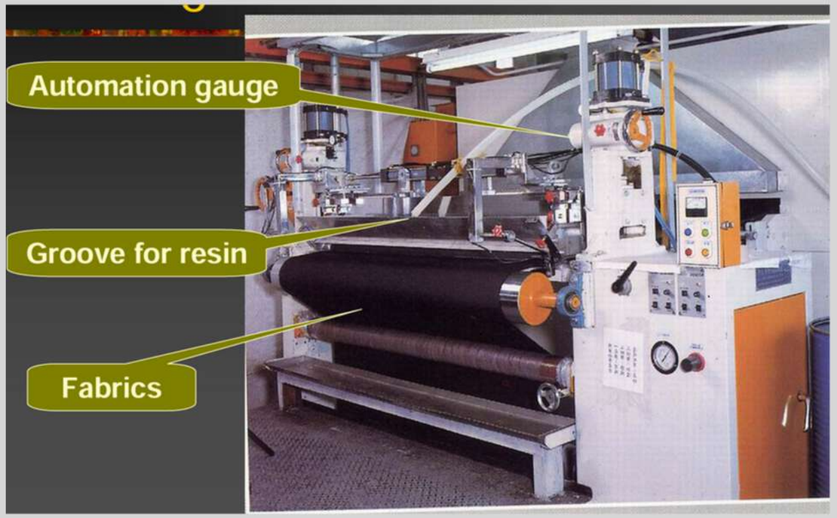
Acrylic resin	Soft feeling, Weather resistance
Urethane resin	Elasticity
Silicone resin	Water and soil repellent, soft, flexible
Fluorine contained resin	Water and oil repellent, Heat resistance, Chemical resistance
PVC polymer	Hard inflammable
Natural or Synthetic rubber	Elasticity

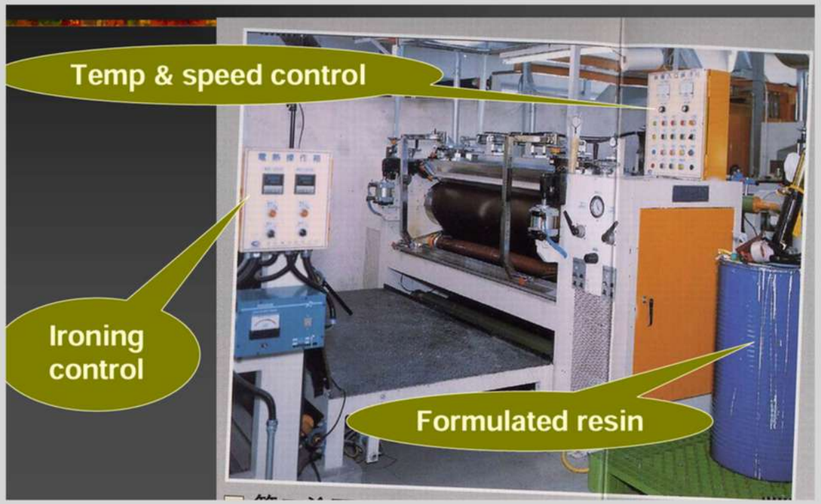


Nava Graphena™ Coat

Integrates coating materials with fabrics to enhance the value of textile products.

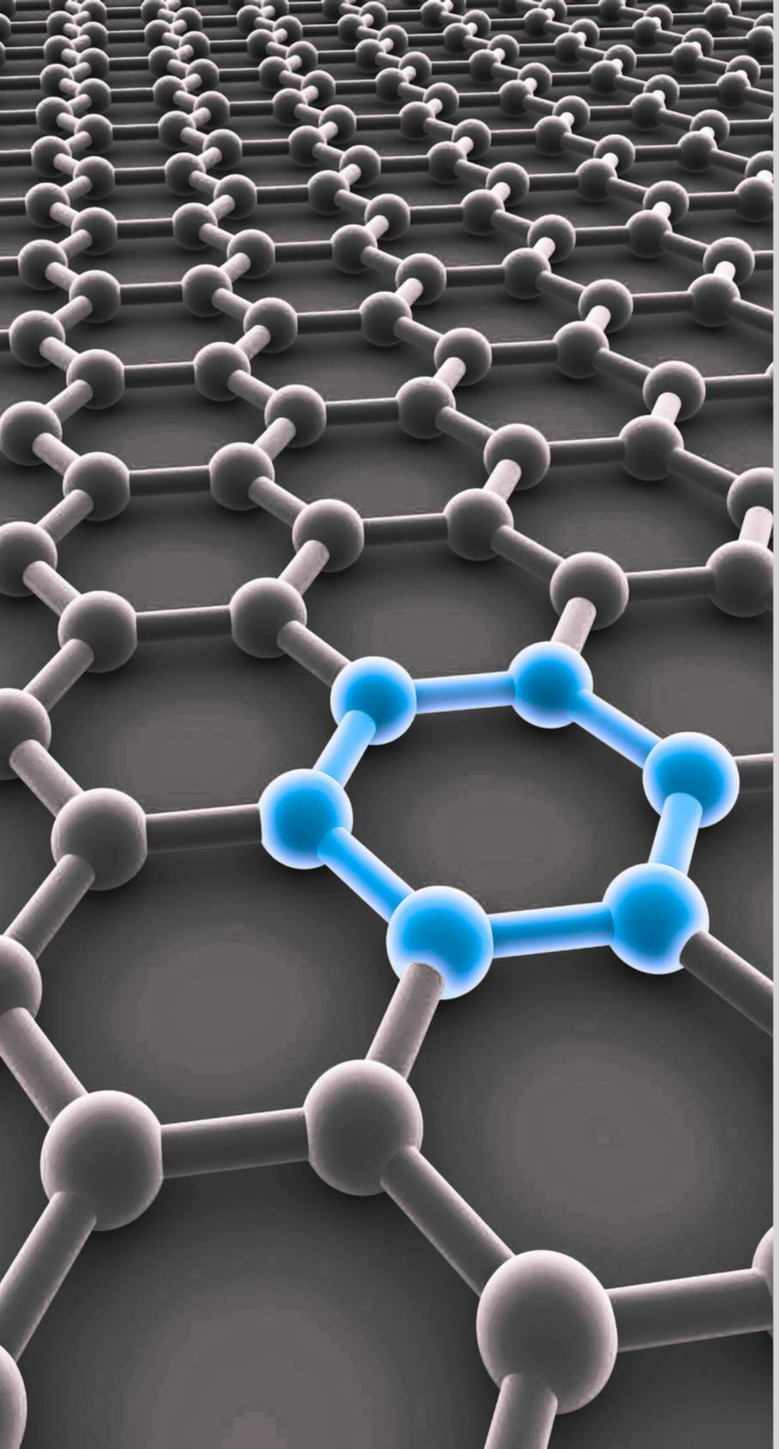
Coating Machine





Application

- Suitable for all kind of fabric



Nava Graphena™ Coat

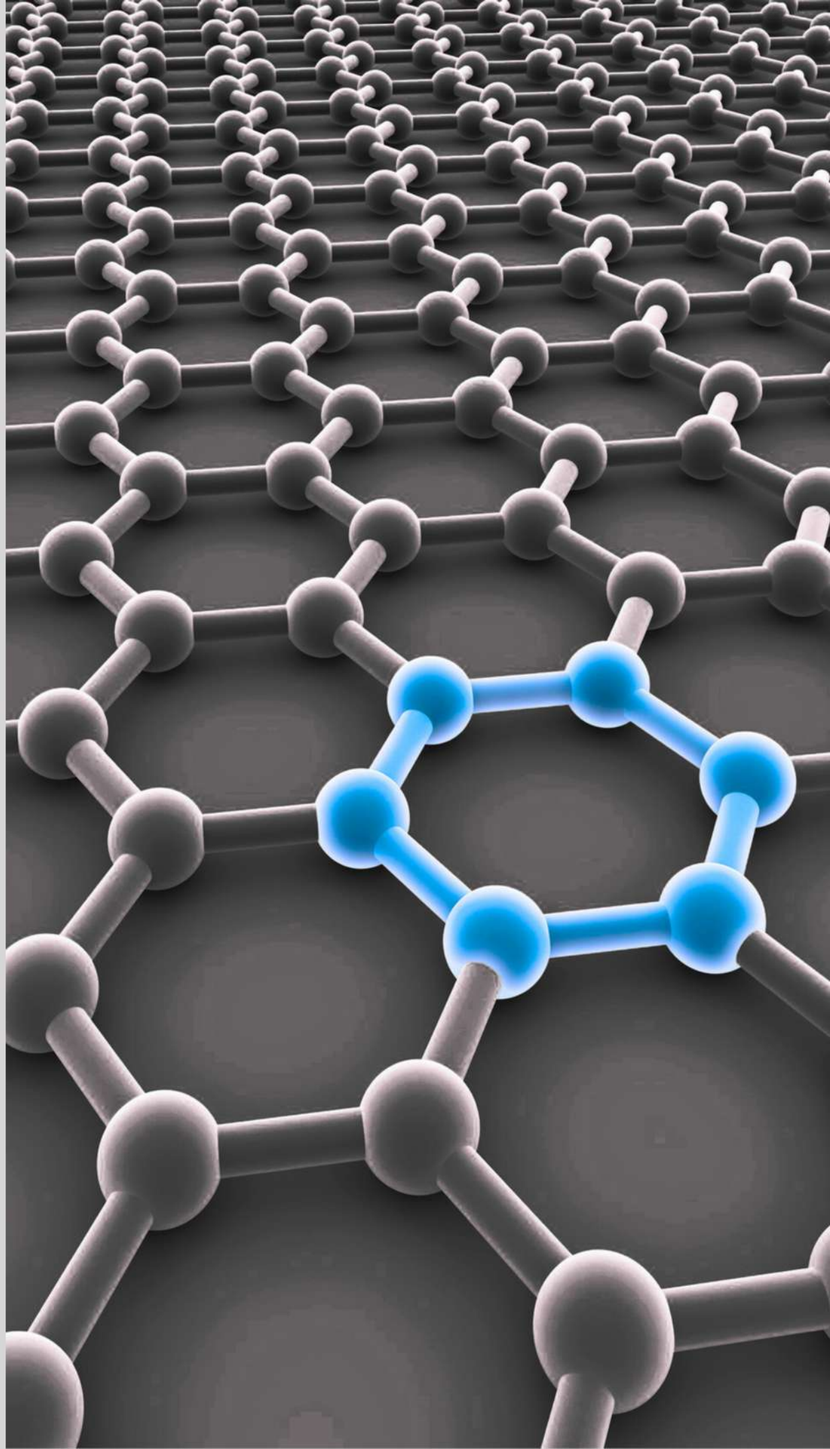
Integrates coating materials with fabrics to enhance the value of textile products.

Application

- Outdoor clothes/Sportwear
  - wind proof, Dow proof, breathable jacket, raincoat.
- Tent , Equipment cover.
- Thermal insulator.
- Luggage, Umbrella
- Technical textile
- Home Textile
- etc.

“Graphene will revolutionize the future of textile materials.„

Source: Science Journal



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