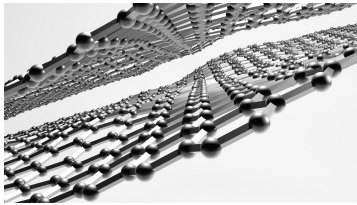




Hielscher Ultrasonics: Ultrasonic Graphene Exfoliation and Dispersion

Ultrasonic graphene exfoliation and dispersion is a process that utilizes high-intensity ultrasound to separate and distribute graphene layers from graphite. This method is effective in producing high-quality graphene with applications in various industries such as electronics, materials science, and energy storage. Hielscher sonicators are utilized worldwide for the successful production of pristine graphene sheets in bulk.



Various industries use Hielscher sonicators already in production stage for high-throughput graphene preparation.

Ultrasonic Exfoliation:

- Using probe-type sonicators, high-power ultrasound is applied with high intensity to a graphite solution.
- The sound waves generate cavitation bubbles in the liquid.
- Upon collapsing, these bubbles produce intense local temperatures and pressures.
- This high-energy environment separates the layers of graphite into individual graphene sheets.
- Simple one-pot application.
- Sonication promotes graphene exfoliation via **Hummer's method** and **liquid-phase exfoliation**

Ultrasonic Dispersion:

- The ultrasonic waves also help to evenly distribute the exfoliated graphene sheets throughout the solution.
- This prevents agglomeration and ensures a stable, uniform dispersion.

Advantages of Ultrasonic Exfoliation and Dispersion

1. High Yield and Quality:

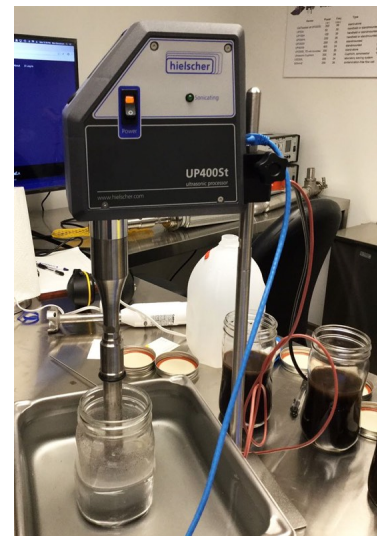
Hielscher sonicators produce high-quality graphene with few defects.

Sonication can achieve a high yield of single-layer or few-layer graphene.

2. Scalability:

The sonication process is scalable for both small and large-scale production.

Suitable for high-throughput industrial applications.



*UP400ST
lab sonicator for
graphene preparation*

3. Cost-Effectiveness:

Ultrasonic exfoliation is relatively low cost compared to other exfoliation methods such as chemical vapor deposition (CVD) or mechanical exfoliation.

4. Environmentally Friendly:

Ultrasonic dispersion of graphene oxide does not require harmful chemicals as sonication enables the production of water-dispersible graphene oxide.

5. Versatility:

Sonication can be used with various solvents and dispersants.

Ultrasonic exfoliation and dispersion is applicable to different types of graphite sources.

Advantages of Hielscher Probe-Type Sonicators

- **Efficient Energy Transfer:** Ultrasonic probes directly transmit ultrasonic energy into the solution, leading to efficient exfoliation.
- **High Intensity:** Hielscher probe-type sonicators generate higher power densities, which are crucial for effective cavitation. This leads subsequently to a more effective breaking down of graphite into graphene sheets.
- **Precise Control:** Hielscher sonicators allow precise control over all important process parameters such as amplitude, intensity and duration of sonication. Thereby, the sonication process can be optimized for different materials and desired outcomes.
- **Uniform Dispersion:** Hielscher ultrasonicators ensure a more uniform dispersion of graphene in the solution and reduce the tendency of graphene sheets to re-agglomerate.
- **Flexibility:** Hielscher sonicators are available for both small laboratory samples and industrial production. The scale-up for industrial applications is completely linear and simple.
- **Control:** Adjustable amplitude and power settings provide flexibility in handling different materials and concentrations.



Industrial sonication system

For what Applications is Ultrasonically-Produced Graphene used?

Electronics: Used in the development of conductive inks, coatings, and flexible electronic devices.

Energy Storage: Enhances the performance of batteries, supercapacitors, and fuel cells.

Composite Materials: Reinforces polymers and other materials to improve their mechanical and thermal properties.

Biomedical: Utilized in drug delivery systems, biosensors, and medical imaging.

Environmental: Employed in water purification, pollutant detection, and environmental monitoring.

Hielscher probe-type sonicators deliver the necessary power for graphene exfoliation and dispersion, which makes sonication a powerful and versatile method for producing high-quality graphene. Its advantages in efficiency, scalability, and cost-effectiveness make it a preferred technique in both research and industrial applications.

Contact us now for more information at info@hielscher.com!