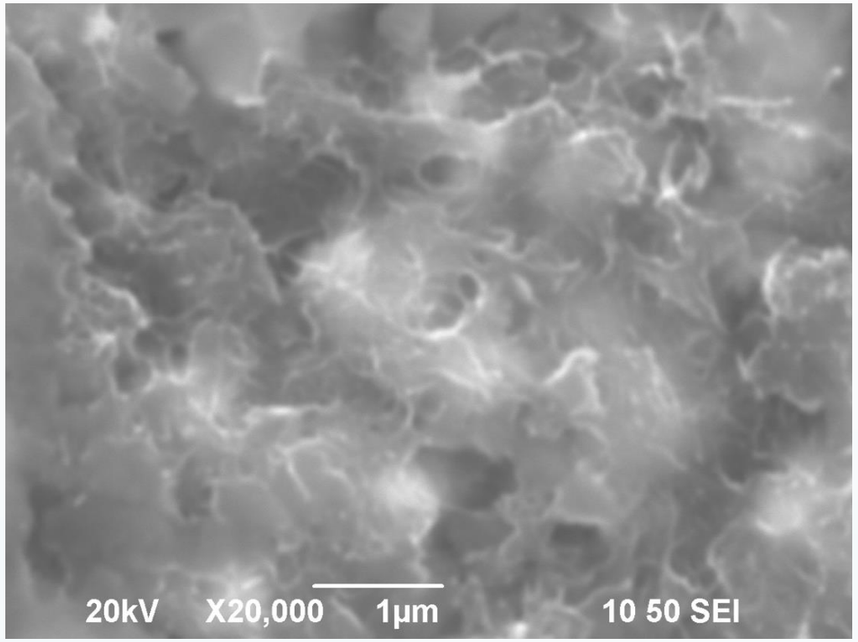
CNT/Graphene Patent Dispersion Technology for High-Performance Heat Exchange and Electromagnetic Wave Absorption Devices

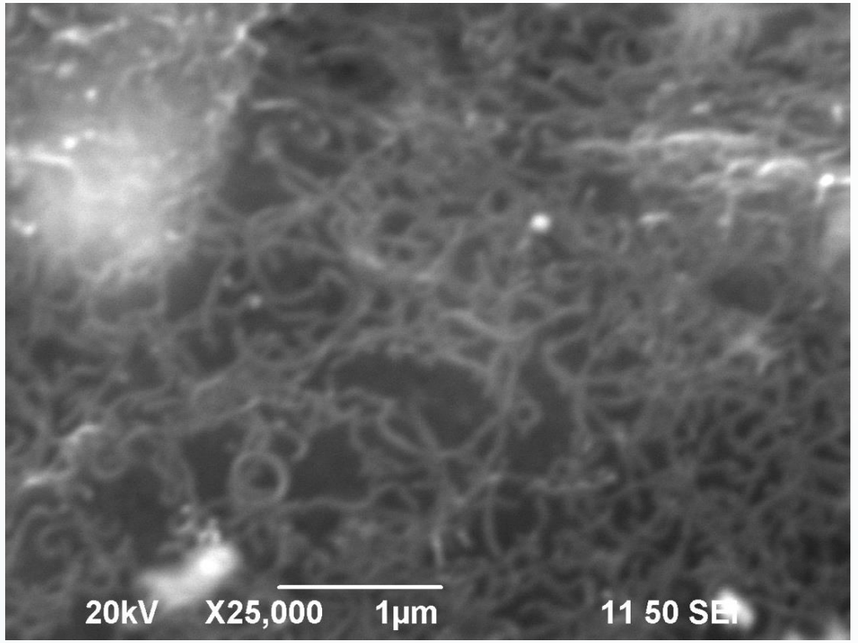
Introducing nanocomposite technology for both heat exchange and electromagnetic wave absorption. Our patented techniques enable unique interface structures with remarkable properties.

HH **HAREO HAMADA, H&J Industries Co., Ltd.**

Visualizing the Technology



This is an SEM image of a high-performance heat exchange device, referred to as the Quantum Cool Device, created using a proprietary electrodeposition technology to produce a CNT/Graphene/Ag nanocomposite.



This is an SEM image of a high-performance electromagnetic wave absorber created using CNT/Graphene/Ag nanomaterials combined with CMCA.

SEM Imagery

SEM images reveal the uniform distribution of CNT/Graphene/Ag CNT/Graphene/Ag nanocomposites. This structure significantly enhances enhances thermal radiation and conductivity characteristics.

Hybrid Structure

The hybrid structure of CNTs and graphene optimizes heat transfer. Silver transfer. Silver nanoparticles further enhance heat dissipation capabilities.

Electromagnetic Wave Absorption Properties

Absorption vs Reflection

Our material absorbs electromagnetic waves rather rather than reflecting them. This This reduces overall system noise noise and interference.

Balanced Performance Performance

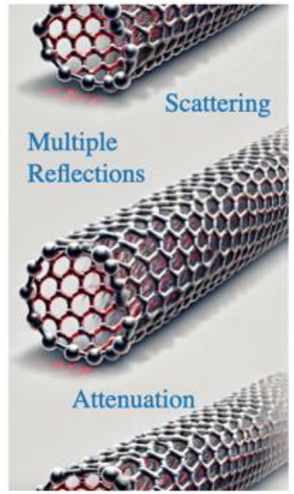
The conductivity and porous structure of CNT/Graphene/Ag CNT/Graphene/Ag allow for balanced reflection and absorption.

Customizable Characteristics

Our technology enables custom design of enhanced electromagnetic wave electromagnetic wave absorption frequency characteristics.

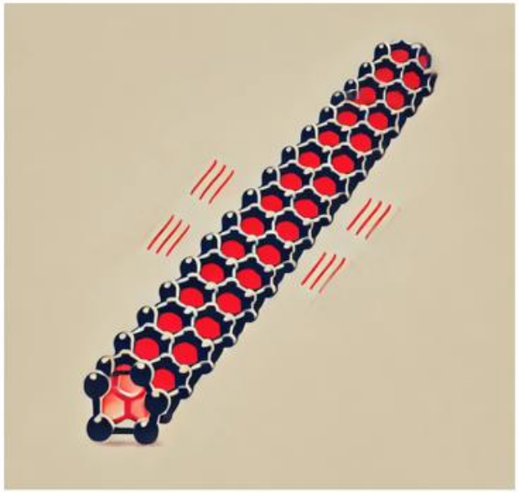
reflection, scattering, attenuation

多重反射 散乱 減衰



re-radiation prevention confinement effects

再放射防止閉じ込め効果



CNT Structure and Electromagnetic Wave Absorption

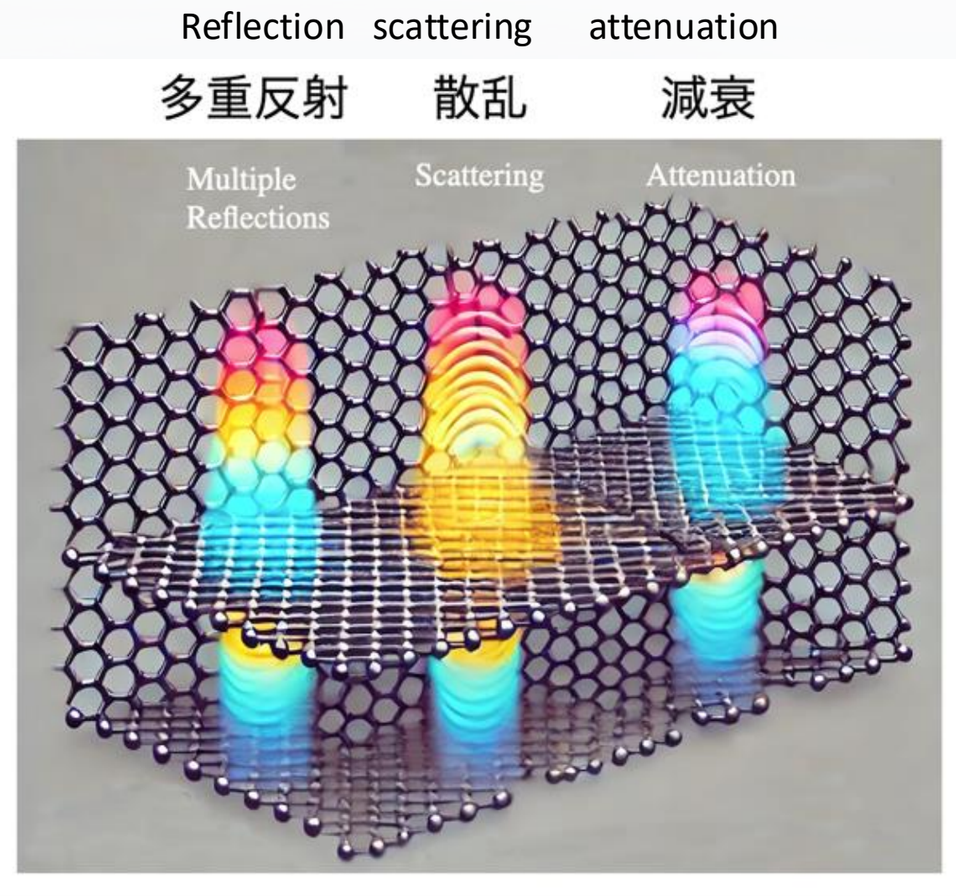
CNT Structure

CNTs are cylindrical carbon structures. Their nanometer-sized tubes interact with electromagnetic waves over a large surface area.

Wave Absorption Process

Electromagnetic waves scatter and reflect within CNTs. Energy gradually converts to heat, preventing external wave escape.

Graphene's Role in Electromagnetic Absorption



1

Graphene Structure

Single-atom layer of carbon in hexagonal lattice. High conductivity and conductivity and surface area.

2

Wave Interaction

Electromagnetic waves absorbed on graphene surface. Energy converted converted to electric current.

3

Multi-layer Effect

Graphene plates trap waves between layers, enhancing energy dissipation.

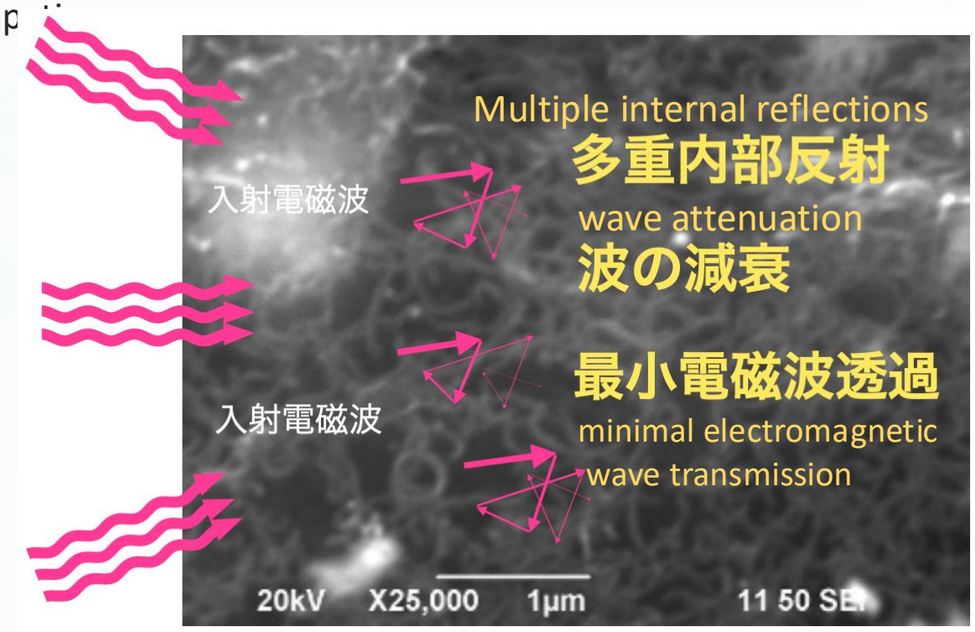
Unique Structural Features

Synergistic Effect

CNT, graphene, and Ag nanoparticles interact to form a high-performance composite.

Hierarchical Structure

Nano and meso-scale features combine, enhancing absorption and heat dissip ..



3D Porous Structure

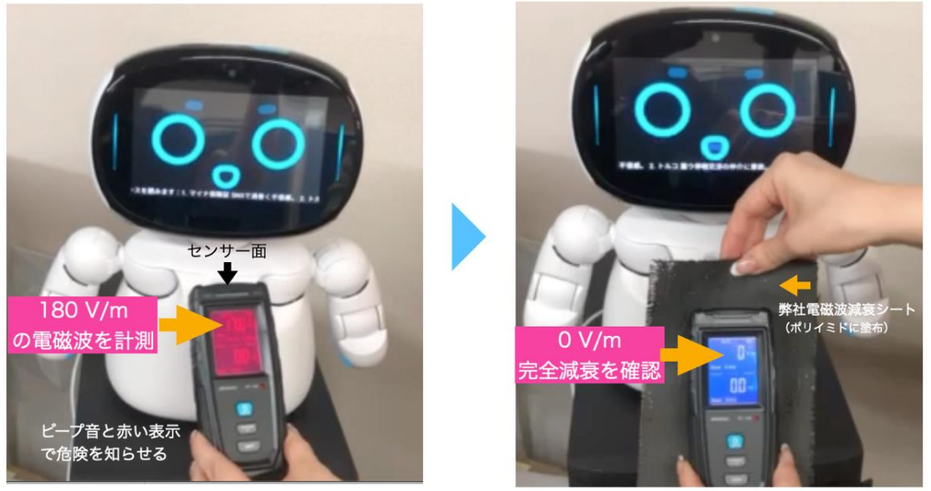
Enables tunable characteristics and robust environmental performance.

Electromagnetic Wave Attenuation Demonstration Demonstration

Experiments demonstrate effective absorption of electromagnetic waves from AC- from AC-DC converters. The material significantly reduces wave intensity, showcasing its practical applications.

Completely attenuates electromagnetic waves generated from within the robot‘s body.あ

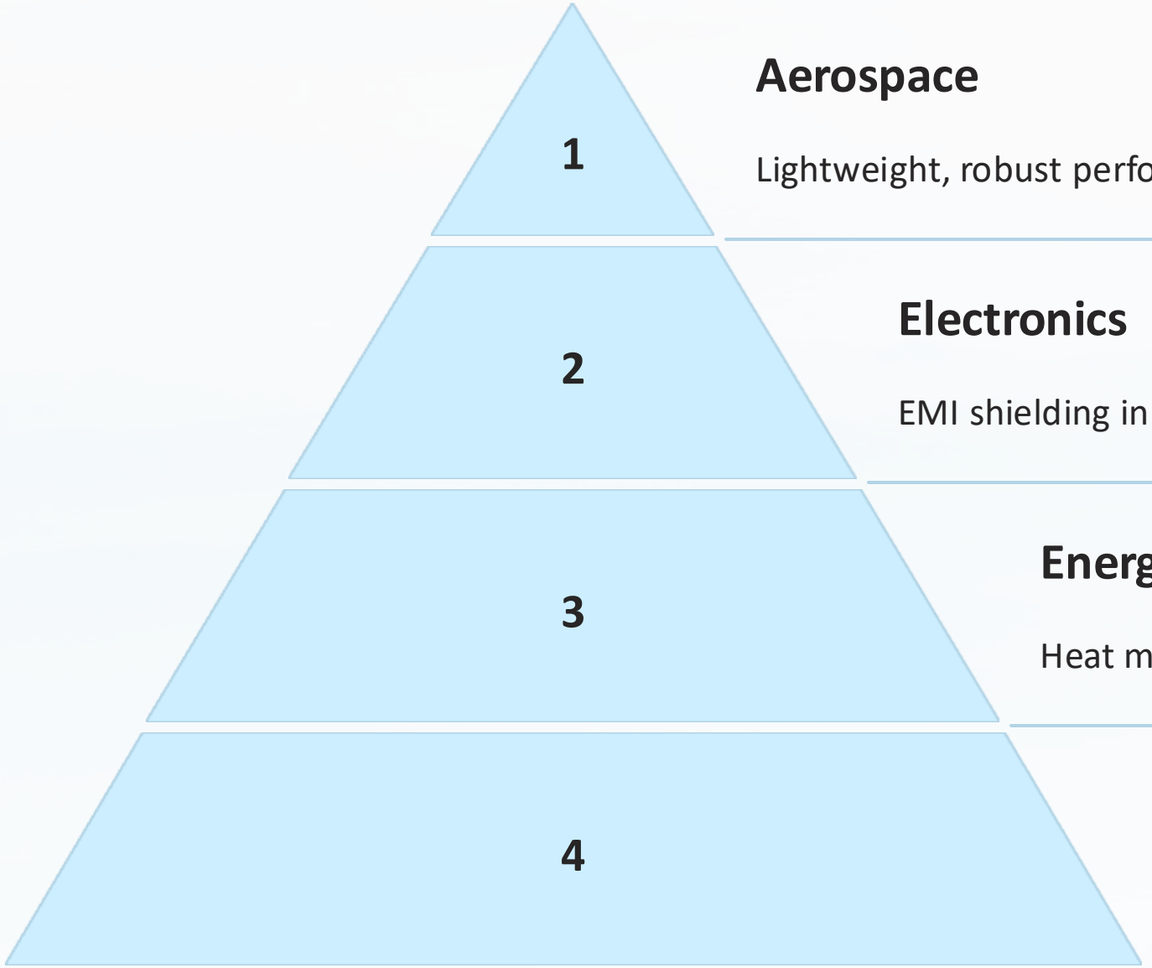
Robot 胴体内部からの発生する電磁波を完全に減衰させる



Electromagnetic Wave Absorption Experiment from an AC-DC Converter

Achieves complete attenuation simply by placing it on the electromagnetic wave attenuation sheet

Applications and Future Prospects



Aerospace

Lightweight, robust performance for space and aviation.

Electronics

EMI shielding in consumer and industrial devices.

Energy

Heat management in power systems.

Emerging Technologies

Adaptable to various markets and applications.