

TROY TECHNICAL

# NANOTECHNOLOGY

## WEEKLY REPORT

October 3 - October 9, 2026 | Issue 2026-W40

**Translation from nanoscale property to  
reproducible, safe and scalable products**

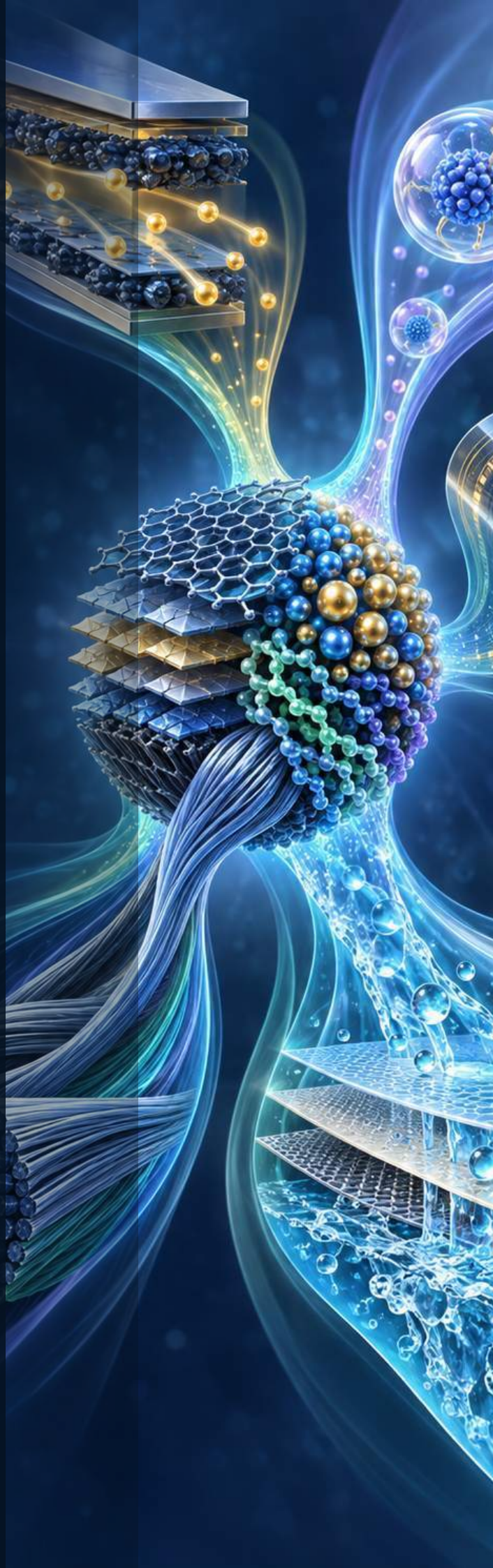
**14**

ANALYZED ARTICLES

**10**

PRIORITY THEMES

Issued 2026-10-09 | English edition | fixed approved cover artwork



# Nanotechnology: the boundary moved from isolated claims to qualification evidence

14 English articles were reviewed independently from the Japanese edition. Ten themes are retained for management decisions.

## SIGNAL 01 | NANO DESIGN

### Zhejiang University Graphene Fiber: 5.9 GPa tensile strength specs

Zhejiang University researchers have successfully developed a high-performance graphene fiber, achieving an impressive tensile strength of 5.9 Gigapascals (GPa) and thermal conductivity of 1,720 Watts/meter · Kelvin (W/m · K) by highly orienting graphene sheets in.

## SIGNAL 02 | SYNTHESIS

### Perovskite Solar Cells: 34.71% efficiency specs for underwater use

A research team has developed a polymer-tuned broadband perovskite solar cell designed to efficiently capture blue-green light prevalent in deep-sea environments.

## SIGNAL 03 | INTEGRATION

### CNT/Fe3O4 Aerogel: Induction welding specs for carbon fiber

Researchers have developed a nanocomposite aerogel incorporating carbon nanotubes (CNT) and Fe3O4, significantly accelerating the induction welding of carbon fiber composites.

## SIGNAL 04 | APPLICATION

### MXene-Polyaniline: VIT-AP University supercapacitor specs

Researchers at VIT-AP University in India have developed a highly durable supercapacitor electrode by slurry-coating a composite of MXene and conductive polymer polyaniline onto graphite sheets.

## DECISION

**Focus this week's management attention on translation from nanoscale property to reproducible, safe and scalable products. Move only when the linked evidence can be reproduced under your own operating conditions.**

## THREE MANAGEMENT MOVES

1. Buyers: prioritize applications with measurable system advantage and a credible qualification path.
2. Suppliers: prove dispersion, interface control, batch consistency, EHS and production economics.
3. Executives: track scale-up, metrology, toxicity, yield, interface stability and application-level value.

## EVIDENCE DISCIPLINE

FACT states what the collected English source reports. BUSINESS READ and ACTION are editorial interpretations. UNKNOWN lists information that the source file does not establish. A linked article is not treated as independent confirmation of every claim.

## Five numbers or evidence anchors that require conditions

**5.9 G**

A13

**SOURCE-BOUND CONDITION**

Zhejiang University researchers have successfully developed a high-performance graphene fiber, achieving an impressive tensile strength of 5.9 Gigapascals (GPa) and thermal conductivity of 1,720 Watts/meter · Kelvin.

**34.71%**

A07

**SOURCE-BOUND CONDITION**

This innovative underwater solar cell achieved a record-breaking power conversion efficiency of 34.71% at a simulated depth of 10 meters.

**94.6%**

A04

**SOURCE-BOUND CONDITION**

This nanocomposite-enabled welding system achieved an initial heating rate of 148.7°C/s, a 94.6% improvement over using carbon fiber composites alone.

**85.4%**

A02

**SOURCE-BOUND CONDITION**

This composite electrode achieved a specific capacitance of 406 F/g at a current density of 0.5 A/g and maintained an exceptional 85.4% of its initial capacity after 10,000 charge-discharge cycles.

**19%**

A01

**SOURCE-BOUND CONDITION**

An AI-guided room-temperature synthesis process has enabled the high-volume production of perovskite nanocrystals for solar cells with 19% efficiency.

**HOW TO USE THESE NUMBERS**

Each value is shown with the condition stated in the collected English article. Do not compare values across different test methods, device sizes, operating temperatures or commercial stages without normalizing those conditions.

Where the value chain moved

Each stage combines one leading theme and one supporting theme. The report treats handoffs as evidence transfers, not decorative arrows.

1

**Nano design**

P01/P06

Zhejiang University researchers have successfully developed a high-performance graphene fiber, achieving an impressive.

2

**Synthesis**

P02/P07

A research team has developed a polymer-tuned broadband perovskite solar cell designed to efficiently capture blue-green.

3

**Integration**

P03/P08

Researchers have developed a nanocomposite aerogel incorporating carbon nanotubes (CNT) and Fe3O4, significantly accelerating.

4

**Application**

P04/P09

Researchers at VIT-AP University in India have developed a highly durable supercapacitor electrode by slurry-coating a.

5

**Scale & safety**

P05/P10

An AI-guided room-temperature synthesis process has enabled the high-volume production of perovskite nanocrystals for solar.

EVIDENCE REQUIRED AT EACH HANDOFF

|                               |                                                                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nano design to Synthesis      | Transfer test conditions, acceptance criteria, failure data, owner and decision date.<br>Recheck scale-up, metrology, toxicity, yield, interface stability and application-level value. |
| Synthesis to Integration      | Transfer test conditions, acceptance criteria, failure data, owner and decision date.<br>Recheck scale-up, metrology, toxicity, yield, interface stability and application-level value. |
| Integration to Application    | Transfer test conditions, acceptance criteria, failure data, owner and decision date.<br>Recheck scale-up, metrology, toxicity, yield, interface stability and application-level value. |
| Application to Scale & safety | Transfer test conditions, acceptance criteria, failure data, owner and decision date.<br>Recheck scale-up, metrology, toxicity, yield, interface stability and application-level value. |

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented scale-up, metrology, toxicity, yield, interface stability and application-level value.

Priority map: maturity and next decision locus



**REPRODUCIBLE POSITIONING RULE**  
Horizontal position uses five discrete stages: Research, Prototype, Joint evaluation, Product adoption and Scale. The vertical bands classify the next decision locus: Tech / process, System / adoption, or Business / rules (including supply systems). Article-title cues take precedence; the overview is used only when the title is silent. These are categories, not impact ranks. Bubble diameter reflects the editorial score.

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P01

## Zhejiang University Graphene Fiber: 5.9 GPa tensile strength specs

A13 | Nano design | Joint evaluation

Date not stated

### FACT

Zhejiang University researchers have successfully developed a high-performance graphene fiber, achieving an impressive tensile strength of 5.9 Gigapascals (GPa) and thermal conductivity of 1,720 Watts/meter · Kelvin (W/m · K) by highly orienting graphene sheets in a high-viscosity glycerol dispersion. This breakthrough significantly advances the industrial application of graphene fibers.

### WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

### BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

### ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P01.

### UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 21/25 | MATURITY 3/5 | DECISION LOCUS: SYSTEM / ADOPTION

P02

## Perovskite Solar Cells: 34.71% efficiency specs for underwater use

A07 | Synthesis | Joint evaluation

Date not stated

### FACT

A research team has developed a polymer-tuned broadband perovskite solar cell designed to efficiently capture blue-green light prevalent in deep-sea environments. This innovative underwater solar cell achieved a record-breaking power conversion efficiency of 34.71% at a simulated depth of 10 meters.

### WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

### BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

### ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P02.

### UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 20/25 | MATURITY 3/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P03

## CNT/Fe3O4 Aerogel: Induction welding specs for carbon fiber

A04 | Integration | Pilot

Date not stated

### FACT

Researchers have developed a nanocomposite aerogel incorporating carbon nanotubes (CNT) and Fe3O4, significantly accelerating the induction welding of carbon fiber composites. This nanocomposite-enabled welding system achieved an initial heating rate of 148.7°C/s, a 94.6% improvement over using carbon fiber composites alone.

### WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

### BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

### ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P03.

### UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

P04

## MXene-Polyaniline: VIT-AP University supercapacitor specs

A02 | Application | Product adoption

Date not stated

### FACT

Researchers at VIT-AP University in India have developed a highly durable supercapacitor electrode by slurry-coating a composite of MXene and conductive polymer polyaniline onto graphite sheets. This composite electrode achieved a specific capacitance of 406 F/g at a current density of 0.5 A/g and maintained an exceptional 85.4% of its initial capacity after 10,000 charge-discharge cycles.

### WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

### BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

### ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P04.

### UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P05

## Perovskite Nanocrystals: AI synthesis specs for 19% efficiency

A01 | Scale & safety | Product adoption

Date not stated

### FACT

An AI-guided room-temperature synthesis process has enabled the high-volume production of perovskite nanocrystals for solar cells with 19% efficiency. This innovative approach, combining the Low-Thermal Reactivity Intermediate (LTRI) method with organic additives (OcA), successfully produces approximately 13 grams of FAPbI<sub>3</sub> nanocrystals per hour in a continuous flow system.

### WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

### BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

### ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P05.

### UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: SYSTEM / ADOPTION

P06

## Canon Nanoimprint: 10x energy reduction for 2026 mass production

A11 | Nano design | Scale-up

Date not stated

### FACT

Canon announced its collaboration with customers to optimize mass production lines for its next-generation nanoimprint lithography (NIL) systems. This technology promises a significant tenfold reduction in power consumption during the exposure phase of semiconductor manufacturing. NIL is positioned to overcome miniaturization challenges, enhancing both sustainability and cost-efficiency within the semiconductor industry.

### WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

### BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

### ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P06.

### UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 20/25 | MATURITY 5/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P07

## GMG Graphene Batteries: 1,000 cycle life and 6-minute charge specs

A12 | Synthesis | Pilot

Date not stated

### FACT

Graphene Manufacturing Group (GMG) announced a significant performance leap for its G<sup>®</sup>CELLS graphene batteries, achieving a 48% increase in energy density and doubling cycle life to 1,000 cycles with 94% energy efficiency during 6-minute fast charging. These advancements surpass conventional LTO batteries and address critical challenges in rapid charging for electric vehicles and large-scale energy storage systems.

### WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

### BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

### ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P07.

### UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

P08

## Hybrid Nanomaterial: 4-in-1 specs for pollutant and B6 detection

A08 | Integration | Pilot

Date not stated

### FACT

A single, novel hybrid nanomaterial has been developed that simultaneously exhibits photocatalytic activity for degrading organic pollutants under visible light and high-sensitivity electrochemical detection of essential Vitamin B6. This '4-in-1' material combines ZnO, NiO, WO<sub>3</sub>, and graphitic carbon nitride via a simple synthetic route. It promises innovative applications in both water treatment and food safety, marking a significant advance in environmental monitoring and healthcare technologies.

### WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

### BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

### ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P08.

### UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P09

InGaAs Quantum Dots: 90% photon interference for 2026 computing

A14 | Application | Research

Date not stated

FACT

A research team has successfully boosted quantum photon interference visibility to an impressive 90% by integrating indium gallium arsenide (InGaAs) quantum dots within optical microcavities. This breakthrough leverages the quantum dots' inherent ability to confine electron excitations and behave as artificial atoms. The 90% visibility significantly enhances the performance of photon sources critical for quantum communication and computing, enabling more robust qubit generation and improved system stability.

WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

P10

DGIST Quantum Dot Display: Specs for world's brightest stretchable

A10 | Scale & safety | Pilot

Date not stated

FACT

A research team at DGIST (Daegu Gyeongbuk Institute of Science and Technology) has successfully developed the world's brightest stretchable quantum dot display. This groundbreaking achievement was published online in Nature Nanotechnology, a leading journal in the nanotechnology field, in September 2026. The developed display combines superior stretchability with high brightness, significantly contributing to the realization of next-generation display technology for flexible electronics and wearable devices.

WHY IT MATTERS

The decision relevance is translation from nanoscale property to reproducible, safe and scalable products. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, prove dispersion, interface control, batch consistency, EHS and production economics.

ACTION

Within 30 days, prioritize applications with measurable system advantage and a credible qualification path; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: scale-up, metrology, toxicity, yield, interface stability and application-level value.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

## Playbook and 0-5 year roadmap

| STAKEHOLDER                                   | NOW   0-30 DAYS                                                                            | NEXT   1-12 MONTHS                                                                  | LATER   1-5 YEARS                                                                   |
|-----------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Operating companies                           | prioritize applications with measurable system advantage and a credible qualification path | Run production-like qualification with explicit acceptance and stop criteria.       | Build a portfolio and architecture that can absorb technology and supplier changes. |
| Materials, equipment and technology suppliers | prove dispersion, interface control, batch consistency, EHS and production economics       | Create shared reliability, process-window and failure-analysis data with customers. | Standardize interfaces, traceability, lifecycle support and recovery services.      |
| Trading, investment and legal teams           | Map scale-up, metrology, toxicity, yield, interface stability and application-level value. | Contract for capacity, quality, change notice, liability, alternatives and exit.    | Diversify regional, technical and customer concentration risk.                      |

### ROADMAP

|                                                                                                                               |                                                                                                                               |                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOW   0-30 DAYS</b><br><b>Evidence ledger</b><br>Owner: Strategy + quality<br>Deliverable: claim, source, condition, owner | <b>NOW   0-30 DAYS</b><br><b>Risk screen</b><br>Owner: Procurement + legal<br>Deliverable: unknowns, alternatives, stop       | <b>NEXT   1-12 MONTHS</b><br><b>Joint qualification</b><br>Owner: R&D + supplier<br>Deliverable: process window and failure data     |
| <b>NEXT   1-12 MONTHS</b><br><b>Commercial gate</b><br>Owner: Business + finance<br>Deliverable: unit economics and capacity  | <b>LATER   1-5 YEARS</b><br><b>Platform strategy</b><br>Owner: Executive team<br>Deliverable: portfolio and interface roadmap | <b>LATER   1-5 YEARS</b><br><b>Service layer</b><br>Owner: Operations + channel<br>Deliverable: monitoring, maintenance and recovery |

### GO / NO-GO GATES

| GATE           | OWNER      | REQUIRED EVIDENCE                               | NO-GO CONDITION                         |
|----------------|------------|-------------------------------------------------|-----------------------------------------|
| G1 Evidence    | Quality    | Source, test conditions and reproducibility     | No traceable evidence                   |
| G2 Integration | R&D        | Interface, process window and failure analysis  | Cannot meet system conditions           |
| G3 Commercial  | Business   | Capacity, total cost, contract and alternatives | Economics or supply cannot be supported |
| G4 Lifecycle   | Operations | Monitoring, maintenance, change notice and exit | No accountable operating plan           |

## ANALYZED ARTICLES | ITEMS 01-14

Every title and URL is displayed in full. URLs wrap without shortening and remain clickable. A verified-reference label means the translated HTML did not retain its original source URL.

| ID  | FULL ARTICLE TITLE                                                 | FULL SOURCE / VERIFIED REFERENCE URL - CLICKABLE                                                                                                                                                                                                                                                                                                                                                                    |
|-----|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A01 | Perovskite Nanocrystals: AI synthesis specs for 19% efficiency     | <a href="https://www.azonano.com/news.aspx?newsID=41853">https://www.azonano.com/news.aspx?newsID=41853</a>                                                                                                                                                                                                                                                                                                         |
| A02 | MXene-Polyaniline: VIT-AP University supercapacitor specs          | <a href="https://bioengineer.org/simple-slurry-coating-trick-yields-mxene-polyaniline-electrode-that-endures-10000-charge-cycles/">https://bioengineer.org/simple-slurry-coating-trick-yields-mxene-polyaniline-electrode-that-endures-10000-charge-cycles/</a>                                                                                                                                                     |
| A03 | NoPo Company: SWCNT technology for 900-fold transistor shrink      | <a href="https://www.dqindia.com/interview/nanomaterials-specially-in-the-carbon-tube-space-have-a-lot-of-advantages-around-clock-speed-cooling-space-application-context-and-quantum-friendliness-12629617">https://www.dqindia.com/interview/nanomaterials-specially-in-the-carbon-tube-space-have-a-lot-of-advantages-around-clock-speed-cooling-space-application-context-and-quantum-friendliness-12629617</a> |
| A04 | CNT/Fe3O4 Aerogel: Induction welding specs for carbon fiber        | <a href="https://bioengineer.org/nanocomposite-aerogel-supercharges-induction-welding-of-carbon-fiber-composites/">https://bioengineer.org/nanocomposite-aerogel-supercharges-induction-welding-of-carbon-fiber-composites/</a>                                                                                                                                                                                     |
| A05 | Master Bond Epoxy: Nanoparticle fillers for 5 W/mK conductivity    | <a href="https://www.masterbond.com/articles/nanoparticle-fillers-improve-epoxy-performance">https://www.masterbond.com/articles/nanoparticle-fillers-improve-epoxy-performance</a>                                                                                                                                                                                                                                 |
| A06 | Graphene Semiconductor: Georgia Tech's 10x faster specs vs silicon | <a href="https://www.techbriefs.com/component/content/article/55969-the-first-functional-semiconductor-made-from-graphene">https://www.techbriefs.com/component/content/article/55969-the-first-functional-semiconductor-made-from-graphene</a>                                                                                                                                                                     |
| A07 | Perovskite Solar Cells: 34.71% efficiency specs for underwater use | <a href="https://now.solar/2026/10/01/polymer-tuned-perovskite-creates-high-efficiency-underwater-solar-cells-physics-world/">https://now.solar/2026/10/01/polymer-tuned-perovskite-creates-high-efficiency-underwater-solar-cells-physics-world/</a>                                                                                                                                                               |
| A08 | Hybrid Nanomaterial: 4-in-1 specs for pollutant and B6 detection   | <a href="https://scienmag.com/four-in-one-nanomaterial-cleans-water-and-spots-vitamin-b6-in-one-go/">https://scienmag.com/four-in-one-nanomaterial-cleans-water-and-spots-vitamin-b6-in-one-go/</a>                                                                                                                                                                                                                 |
| A09 | LSU Gas Leak Detection: 95% accuracy specs via optical fiber       | <a href="https://lsureveille.com/289239/tigertv/lsu-makes-major-breakthrough-in-detecting-gas-leaks/">https://lsureveille.com/289239/tigertv/lsu-makes-major-breakthrough-in-detecting-gas-leaks/</a>                                                                                                                                                                                                               |
| A10 | DGIST Quantum Dot Display: Specs for world's brightest stretchable | <a href="https://www.miragenews.com/dgist-develops-brightest-stretchable-quantum-1755916/">https://www.miragenews.com/dgist-develops-brightest-stretchable-quantum-1755916/</a>                                                                                                                                                                                                                                     |
| A11 | Canon Nanoimprint: 10x energy reduction for 2026 mass production   | <a href="https://global.canon/en/technology/canon-tech/interview/nanoimprint/">https://global.canon/en/technology/canon-tech/interview/nanoimprint/</a>                                                                                                                                                                                                                                                             |
| A12 | GMG Graphene Batteries: 1,000 cycle life and 6-minute charge specs | <a href="https://graphenemg.com/gmg-announces-48-increase-in-energy-density-doubling-of-cycle-life-and-94-energy-efficiency-for-6-minute-fast-charge/">https://graphenemg.com/gmg-announces-48-increase-in-energy-density-doubling-of-cycle-life-and-94-energy-efficiency-for-6-minute-fast-charge/</a>                                                                                                             |
| A13 | Zhejiang University Graphene Fiber: 5.9 GPa tensile strength specs | <a href="https://en.sedaily.com/technology/2026/10/07/graphene-moves-from-lab-to-gymnasts-uniforms-and-artificial">https://en.sedaily.com/technology/2026/10/07/graphene-moves-from-lab-to-gymnasts-uniforms-and-artificial</a>                                                                                                                                                                                     |
| A14 | InGaAs Quantum Dots: 90% photon interference for 2026 computing    | <a href="https://www.thebrighterside.news/post/a-tiny-semiconductor-device-lifts-quantum-photon-interference-visibility-to-90/">https://www.thebrighterside.news/post/a-tiny-semiconductor-device-lifts-quantum-photon-interference-visibility-to-90/</a>                                                                                                                                                           |

# Nanotechnology — Selected Articles

Date: 2026-10-11

Articles: 15

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- #02 MXene-Polyaniline: VIT-AP University supercapacitor specs
- #03 NoPo Company: SWCNT technology for 900-fold transistor shrink
- #04 CNT/Fe<sub>3</sub>O<sub>4</sub> Aerogel: Induction welding specs for carbon fiber
- #05 Master Bond Epoxy: Nanoparticle fillers for 5 W/mK conductivity
- #06 CNTs Dominate Nanocarbon Market with 63% Share in 2025, Driving Demand in EV Batteries and Advanced Composites
- #06 Graphene Semiconductor: Georgia Tech's 10x faster specs vs silicon
- #07 Perovskite Solar Cells: 34.71% efficiency specs for underwater use
- #08 Hybrid Nanomaterial: 4-in-1 specs for pollutant and B6 detection
- #09 LSU Gas Leak Detection: 95% accuracy specs via optical fiber
- #10 DGIST Quantum Dot Display: Specs for world's brightest stretchable
- #11 Canon Nanoimprint: 10x energy reduction for 2026 mass production
- #12 GMG Graphene Batteries: 1,000 cycle life and 6-minute charge specs
- #13 Zhejiang University Graphene Fiber: 5.9 GPa tensile strength specs
- #14 InGaAs Quantum Dots: 90% photon interference for 2026 computing

# #01 Perovskite Nanocrystals: AI synthesis specs for 19% efficiency

Published October 07, 2026   AZoNano   Unknown



## OVERVIEW

An AI-guided room-temperature synthesis process has enabled the high-volume production of perovskite nanocrystals for solar cells with 19% efficiency. This innovative approach, combining the Low-Thermal Reactivity Intermediate (LTRI) method with organic additives (OCA), successfully produces approximately 13 grams of FAPbI<sub>3</sub> nanocrystals per hour in a continuous flow system. The simplified manufacturing at ambient temperatures overcomes traditional high-temperature synthesis challenges, paving the way for cost-effective, large-scale production of high-quality perovskite nanocrystals.

### Key Findings

A novel artificial intelligence (AI)-guided room-temperature synthesis method has been developed, enabling the high-volume production of high-quality perovskite nanocrystals for solar cells that achieve 19% conversion efficiency. This groundbreaking process dramatically simplifies manufacturing and reduces costs compared to conventional high-temperature synthesis methods, marking a significant step towards accelerating the commercialization of advanced photovoltaic technologies.

### Technical / Clinical Details

The new synthesis strategy integrates the Low-Thermal Reactivity Intermediate (LTRI) method with organic additives (OcA), which precisely control the nucleation and growth of the nanocrystals. This optimized process allowed the research team to consistently produce approximately 13 grams of FAPbI<sub>3</sub> nanocrystals per hour in a continuous flow system. Achieving gram-scale production of high-quality crystals at ambient temperatures represents a significant advancement, offering an energy-efficient manufacturing pathway. Perovskite nanocrystals, renowned for their strong light absorption and excellent charge carrier mobility, are crucial for enhancing solar cell efficiency.

### Background & Context

Perovskite solar cells are garnering substantial attention as a next-generation photovoltaic technology due to their potential for high efficiency—comparable to or exceeding silicon-based cells—and lower manufacturing costs. However, the mass production of high-quality perovskite crystals has been hindered by bottlenecks, particularly those associated with high-temperature processes and complex batch production methods. The AI-guided, room-temperature continuous flow synthesis demonstrated in this study directly addresses these manufacturing challenges, substantially boosting the commercial viability of perovskite solar cells.

## Strategic Significance & Outlook

The AI-guided room-temperature synthesis of perovskite nanocrystals is poised to significantly impact the solar energy industry. This technology promises to facilitate the production of cheaper and more efficient solar cells, further accelerating the adoption of renewable energy. Furthermore, this approach is not limited to perovskite materials but can potentially be applied to the manufacturing processes of other functional nanomaterials, leading to broader innovations in materials science production techniques. Future efforts will likely focus on industrial-scale demonstration and further enhancements in efficiency and stability.

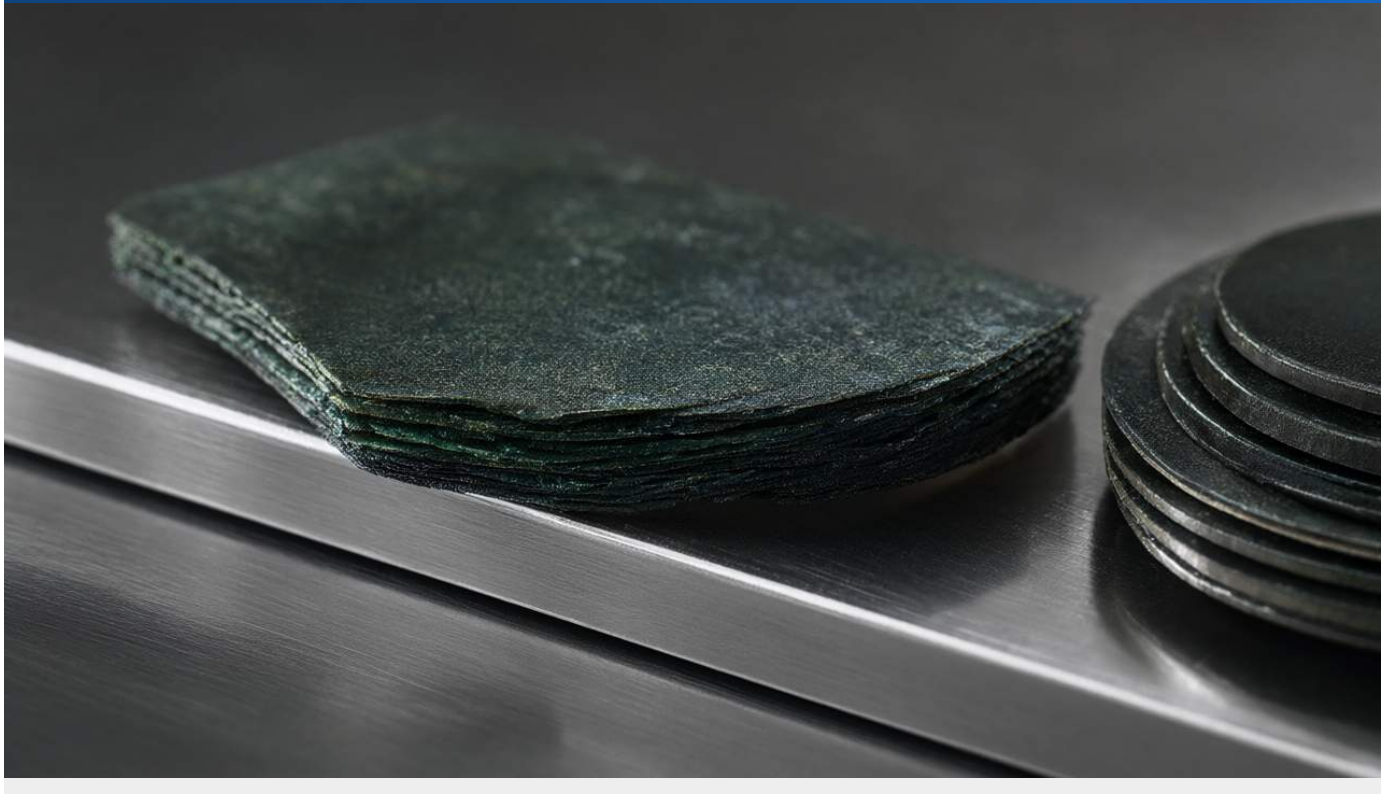
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Source: <https://www.azonano.com/news.aspx?newsID=41853>

Collected: October 09, 2026 | Automated Research System (Gemini API)

## #02 MXene-Polyaniline: VIT-AP University supercapacitor specs

Published October 02, 2026   Bioengineer.org   India



### OVERVIEW

Researchers at VIT-AP University in India have developed a highly durable supercapacitor electrode by slurry-coating a composite of MXene and conductive polymer polyaniline onto graphite sheets. This composite electrode achieved a specific capacitance of 406 F/g at a current density of 0.5 A/g and maintained an exceptional 85.4% of its initial capacity after 10,000 charge-discharge cycles. This simple, cost-effective manufacturing method significantly advances the industrial application of high-performance energy storage devices.

### Key Findings

Researchers at VIT-AP University in India have successfully fabricated a highly durable supercapacitor electrode by combining MXene with the conductive polymer polyaniline and applying it onto graphite sheets using a slurry-coating method. This innovative electrode demonstrated a high specific capacitance of 406 F/g at a current density of 0.5 A/g, and remarkably, maintained 85.4% of its initial capacity after 10,000 charge-discharge cycles. This significant stability contributes greatly to extending the lifespan and enhancing the reliability of energy storage devices.

### Technical / Clinical Details

The research team focused on combining the high electrical conductivity and surface area of MXene ( $\text{Ti}_3\text{C}_2\text{T}_x$ ) nanosheets with the excellent electrochemical properties of polyaniline. By employing a simple and cost-effective slurry-coating technique, they achieved uniform dispersion of both materials and strong adhesion to the graphite substrate. The resulting MXene-polyaniline composite electrode exhibits high charge storage capability and stable cycling performance during the adsorption-desorption processes of electrolyte ions in supercapacitors. The specific capacitance of 406 F/g is superior to many existing supercapacitor electrode materials, and the 85.4% capacity retention after 10,000 cycles is a crucial indicator of practical applicability in real-world scenarios.

### Background & Context

Supercapacitors are garnering attention as next-generation energy storage devices across various fields, including electric vehicles, renewable energy storage, and portable electronics, due to their rapid charge-discharge capabilities and long cycle life. However, their energy density is typically lower than batteries, necessitating performance improvements through material development. MXene, with its two-dimensional structure and metallic electrical conductivity, holds immense promise as a supercapacitor electrode material. This study marks a significant step towards practical application by not only utilizing MXene but also combining it with polyaniline and employing a straightforward slurry-coating method.

## Strategic Significance & Outlook

The development of this MXene-polyaniline composite electrode significantly reduces the manufacturing cost of high-performance, durable supercapacitors, opening wide avenues for industrial application. The simple slurry-coating method is also suitable for mass production, which will accelerate commercialization. Moving forward, if supercapacitors with even higher energy and power densities can be developed based on this technology, they are expected to contribute to solving a wide range of societal challenges, such as reducing electric vehicle charging times and stabilizing power in smart grids. This research also demonstrates the potential of universities in emerging economies like India to contribute to global energy technology innovation.

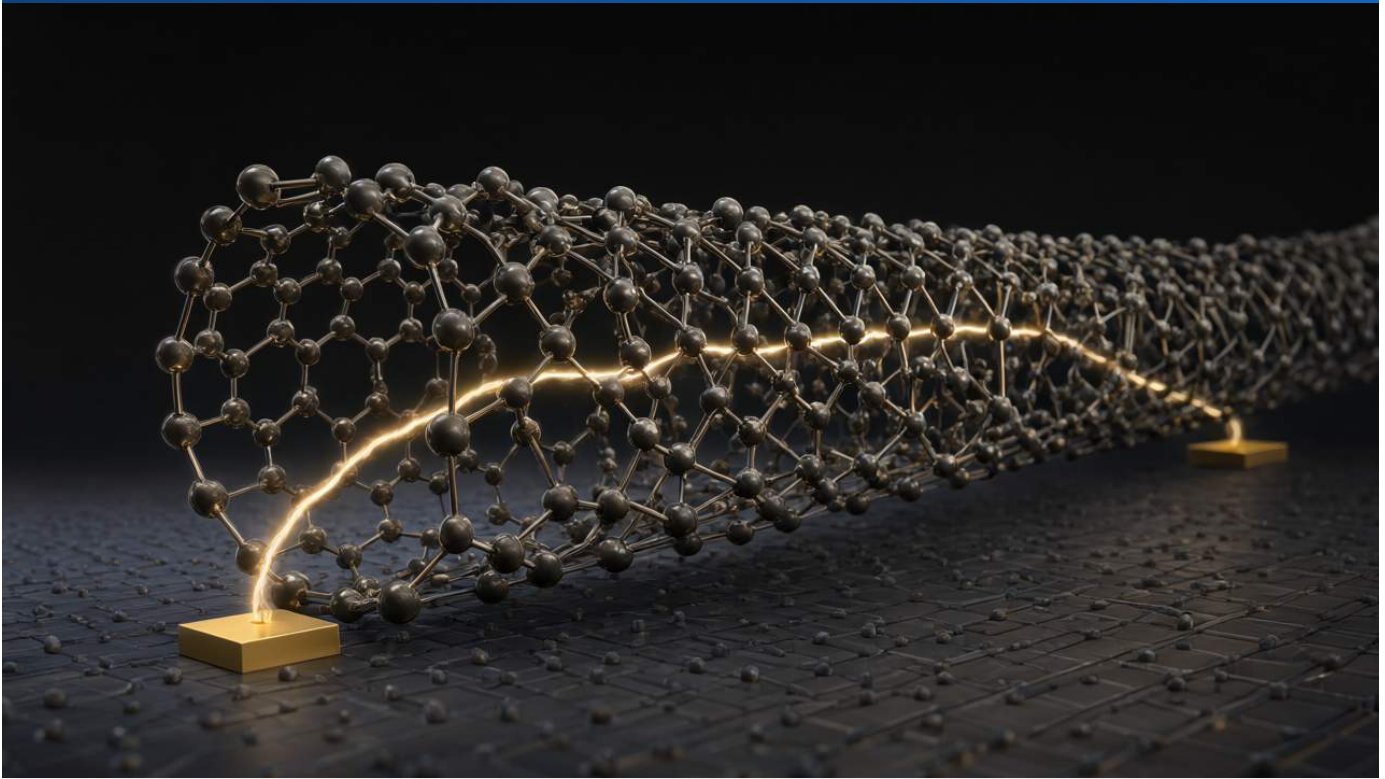
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Source: <https://bioengineer.org/simple-slurry-coating-trick-yields-mxene-polyaniline-electrode-that-endures-10000-charge-cycles/>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #03 NoPo Company: SWCNT technology for 900-fold transistor shrink

Published October 06, 2026   Dataquest   India



## OVERVIEW

India's NoPo Company is pioneering advancements in electronics, energy storage, water purification, aerospace, and mobility through its single-walled carbon nanotube (SWCNT) technology. Their SWCNT-based transistors, using a single nanotube (1nm diameter, 10nm length), achieve a drastic size reduction compared to conventional 2nm silicon transistors (900nm<sup>2</sup> area), accelerating faster semiconductors, high-sensitivity sensors, improved EV batteries, and next-generation structural materials. NoPo holds key patents for reducing reactor CAPEX, lowering catalyst costs, and enhancing nanomaterial purification, establishing itself as India's sole and one of the world's few SWCNT manufacturers.

### Key Findings

India's NoPo Company is achieving groundbreaking progress in the electronics sector through its innovative single-walled carbon nanotube (SWCNT) technology. The company's technology enables an order-of-magnitude reduction in transistor size, with a single SWCNT (1nm diameter, 10nm length) transistor compared to the 900nm<sup>2</sup> area of a conventional 2nm silicon transistor. This drastic miniaturization dramatically accelerates the development of faster semiconductors, high-sensitivity sensors, improved electric vehicle (EV) batteries, and next-generation structural materials.

### Technical / Clinical Details

NoPo's SWCNT technology leverages its unique properties to enhance performance across a wide range of applications. In electronics, the superior conductivity and minute size of SWCNTs allow for a significant increase in transistor integration density and operating speed. The most advanced single-walled nanotube transistors are constructed from just one nanotube, representing a 900-fold area reduction compared to silicon transistors. This miniaturization directly leads to the realization of higher-performance, more power-efficient processors.

In the energy storage sector, integrating SWCNTs into EV battery electrode materials contributes to faster charging rates and increased energy density. For water purification, high-performance filters are being developed that utilize the fine pore structure of nanotubes to efficiently remove impurities. In aerospace and mobility, adding SWCNTs to composite materials results in lightweight, high-strength structural components, improving fuel efficiency and safety. NoPo holds several key patents related to reducing reactor capital expenditure, lowering catalyst costs, and enhancing nanomaterial purification, ensuring cost-effectiveness and quality in SWCNT commercial production.

## Background & Context

Nanomaterials, exhibiting unique quantum properties at their ultra-small scale, hold the potential to deliver revolutionary solutions across diverse industrial sectors, including electronics, energy, and medicine. Carbon nanotubes, in particular, stand alongside graphene and quantum dots as prominent 2D materials undergoing active research and development. In the semiconductor industry, as Moore's Law approaches its physical limits, there is growing anticipation for SWCNTs as a next-generation material to supersede silicon. NoPo Company is one of India's sole and a globally rare leading manufacturer of SWCNTs, establishing its competitive advantage in the global market through its technological prowess.

## Strategic Significance & Outlook

NoPo's SWCNT technology has the potential to define the future direction of the electronics industry. The miniaturization and acceleration of transistors are critical for the evolution of artificial intelligence (AI), high-performance computing, and IoT devices. Enhancements in EV battery performance will accelerate the transition to a decarbonized society. The cost reduction and manufacturing efficiency improvements demonstrated by the company's patented technologies are expected to promote the widespread commercialization of SWCNTs, bringing the benefits of nanotechnology to numerous industries. In the future, these SWCNT-based innovations may also find applications in cutting-edge technology fields such as quantum computing and novel medical devices.

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Source: [https://www.dqindia.com/interview/nanomaterials-specially-in-the-carbon-tube-space-have-a-lot-of-advantages-around-clock-speed-cooling-space-application-context-and-quantum-friendliness-](https://www.dqindia.com/interview/nanomaterials-specially-in-the-carbon-tube-space-have-a-lot-of-advantages-around-clock-speed-cooling-space-application-context-and-quantum-friendliness-12629617)

12629617

## #04 CNT/Fe<sub>3</sub>O<sub>4</sub> Aerogel: Induction welding specs for carbon fiber

Published October 05, 2026   Bioengineer.org   International



### OVERVIEW

Researchers have developed a nanocomposite aerogel incorporating carbon nanotubes (CNT) and Fe<sub>3</sub>O<sub>4</sub>, significantly accelerating the induction welding of carbon fiber composites. This nanocomposite-enabled welding system achieved an initial heating rate of 148.7°C/s, a 94.6% improvement over using carbon fiber composites alone. The enhanced performance stems from systematically balancing the electrical conductivity and magnetic loss of the nanocomposite, potentially revolutionizing composite joining technologies in aerospace and automotive industries.

### Key Findings

Researchers have successfully developed a nanocomposite aerogel featuring varying ratios of carbon nanotubes (CNT) and Fe<sub>3</sub>O<sub>4</sub> nanoparticles, dramatically accelerating the heating rate in the induction welding of carbon fiber composites. This nanocomposite-enhanced welding system recorded an initial heating rate of 148.7°C/s, representing a 94.6% improvement compared to the rate achieved with carbon fiber composites alone. This breakthrough promises to significantly enhance the efficiency and reliability of composite manufacturing and repair processes.

### Technical / Clinical Details

The study involved the fabrication and evaluation of diverse nanocomposite compositions to identify the optimal ratio of CNT and Fe<sub>3</sub>O<sub>4</sub>. The key to this performance enhancement lies in the precise control over the balance between the nanocomposite's electrical conductivity and magnetic loss. During the induction welding process, high-frequency magnetic fields generate eddy currents and hysteresis losses within the material, which in turn produce heat. By combining the excellent electrical conductivity of CNTs with the magnetic properties of Fe<sub>3</sub>O<sub>4</sub>, the system achieves highly efficient heat generation—a capability not possible with conventional composites alone—leading to a substantial increase in the initial heating rate.

### Background & Context

Carbon fiber composites are widely used across industries such as aerospace, automotive, and wind energy due to their exceptional lightweight and high-strength properties. However, efficient and reliable joining of these composite materials has been a major challenge in manufacturing and repair processes. Induction welding is a promising technique given its ability for rapid and localized heating, but improvements in heating efficiency were needed. The nanocomposite aerogel developed in this research offers an innovative solution to this challenge, contributing to the realization of faster and more robust composite joining technologies.

## Strategic Significance & Outlook

This induction welding technology, leveraging nanocomposite aerogels, is expected to find broad industrial applications, including airframe manufacturing and repair in aerospace, assembly of lightweight components in the automotive sector, and production of wind turbine blades. The accelerated heating rates will directly translate into reduced production cycle times and lower manufacturing costs, further boosting the adoption of composite materials. In the future, this technology is anticipated to establish new standards in composite design and manufacturing, promoting the development of more sustainable and higher-performance products.

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Source: <https://bioengineer.org/nanocomposite-aerogel-supercharges-induction-welding-of-carbon-fiber-composites/>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #05 Master Bond Epoxy: Nanoparticle fillers for 5 W/mK conductivity

Published October 01, 2026   MasterBond.com   USA



## OVERVIEW

Master Bond has developed nanoparticle-filled epoxy adhesives, significantly enhancing performance for demanding electronics, optical, aerospace, and automotive applications. Notably, nano-graphene-filled EP30NG, a room-temperature curing two-component epoxy, delivers superior physical strength and an exceptionally high thermal conductivity exceeding 5 W/mK. This material is ideal for applications requiring high heat transfer and low thermal resistance, setting a new benchmark for high-performance adhesives.

### Key Findings

Master Bond has developed a range of epoxy adhesives incorporating nanoparticle fillers, achieving significant performance enhancements that meet the stringent requirements of the electronics, optical, aerospace, and automotive industries. Specifically, the nano-graphene-filled EP30NG stands out as a two-component, room-temperature curing epoxy that provides excellent physical strength properties coupled with an exceptionally high thermal conductivity exceeding 5 W/mK. These attributes are critical for applications demanding efficient heat transfer and minimal thermal resistance.

### Technical / Clinical Details

The integration of nanoparticle fillers into specific epoxy formulations dramatically improves key mechanical, electrical, thermal, and optical properties. In EP30NG, the nano-graphene is specifically chosen to optimize thermal conduction, achieving thermal conductivity values over 5 W/mK—a level difficult to attain with conventional fillers. This equips the adhesive with superior heat dissipation capabilities, crucial for maintaining device performance and extending the lifespan of high-power electronic components and thermal-sensitive systems. Furthermore, its ability to cure at room temperature simplifies application for complex assemblies and heat-sensitive components.

### Background & Context

Modern electronic devices and high-performance systems are characterized by increasing miniaturization and component density, making thermal management a formidable challenge. Conventional adhesives and encapsulants often fall short in addressing these thermal issues, leading to device failures and performance degradation. Advances in nanotechnology have enabled the use of nanoparticles as fillers, allowing unprecedented control and improvement over material properties. Master Bond's development is at the forefront of this innovation, proposing a new standard for thermal management solutions.

## Strategic Significance & Outlook

The demand for nanoparticle-filled epoxy adhesives is rapidly escalating in cutting-edge sectors where thermal management is a critical factor, such as 5G communication devices, EV battery packs, high-performance computing, and aerospace structural bonding. Products like EP30NG enhance design flexibility in these areas, enabling the development of more reliable and higher-performing products. Master Bond is poised to further advance this technology, developing custom formulations tailored to specific industrial needs, thereby strengthening its leadership in the high-performance materials market.

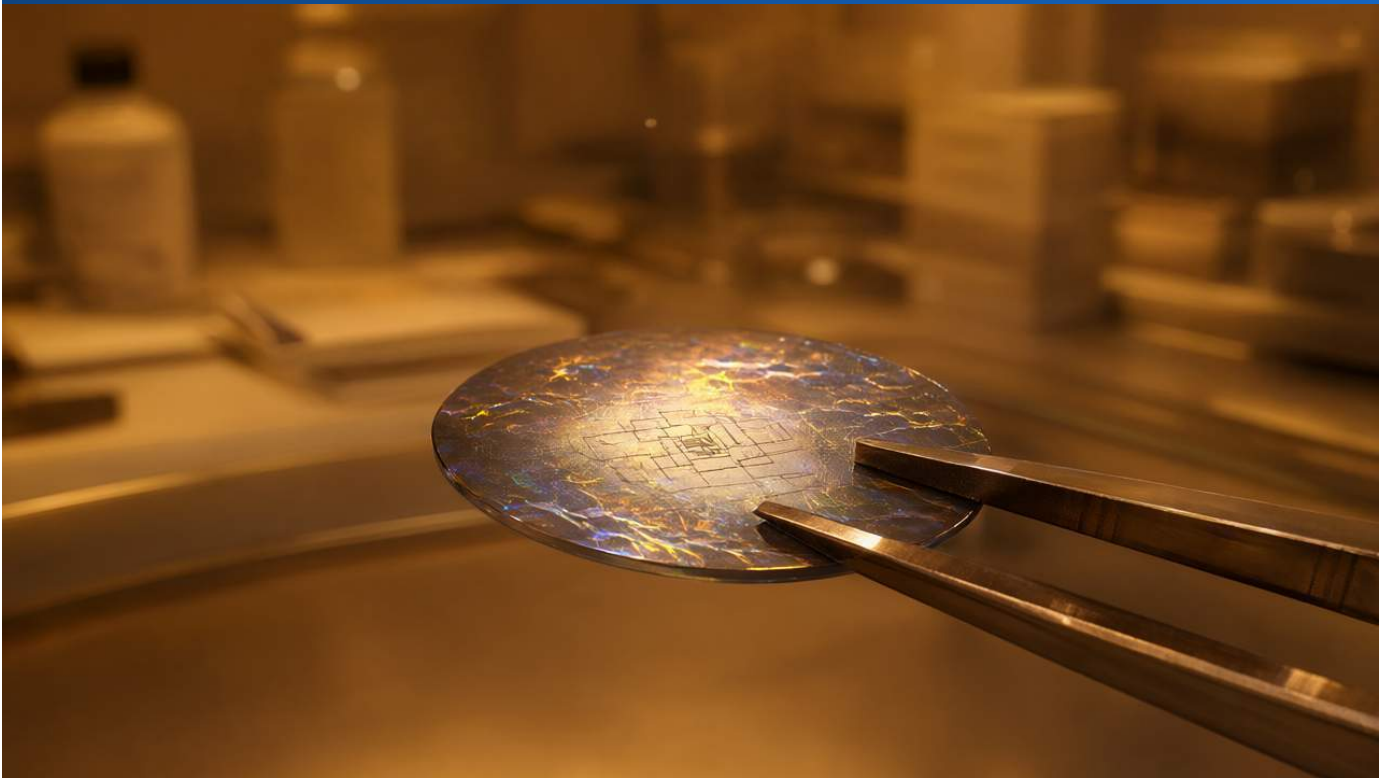
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Source: <https://www.masterbond.com/articles/nanoparticle-fillers-improve-epoxy-performance>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #06 CNTs Dominate Nanocarbon Market with 63% Share in 2025, Driving Demand in EV Batteries and Advanced Composites

Published October 06, 2026   DataM Intelligence   USA



## OVERVIEW

Carbon Nanotubes (CNTs) commanded an impressive 63% market share in the nanocarbon market in 2025, driven by their established presence in battery conductive additives, conductive polymers, electronics, EMI shielding, and advanced composites. OCSiAl's single-walled carbon nanotubes (SWCNTs) are expanding applications, notably integrated into the Horizon Europe ELEVATE project for future electric regional aircraft batteries. Furthermore, Canatu secured a significant order exceeding €5 million for EUV pellicle manufacturing, underscoring nanocarbon's strategic value.

### Key Findings

In the nanocarbon market, carbon nanotubes (CNTs) established a dominant position, capturing a 63% market share in 2025. This supremacy stems from their widespread adoption across established high-growth application areas, including conductive additives for EV batteries, conductive polymers, electronics, electromagnetic interference (EMI) shielding, and advanced composites.

### Technical / Clinical Details

CNTs are central to the nanocarbon market due to their exceptional electrical and mechanical properties. In battery applications, a small addition of CNTs enhances the energy density and fast-charging capabilities of lithium-ion batteries. In conductive polymers, CNTs form an electrical conduction network, improving electrostatic discharge (ESD) protection and sensor functionality. In electronics, CNT-based transparent conductive films are utilized in next-generation displays and flexible devices, while in EMI shielding, they effectively suppress unwanted electromagnetic radiation from electronic equipment.

Notably, single-walled carbon nanotubes (SWCNTs) manufactured by OCSiAl have been integrated into the Horizon Europe ELEVATE project, a European research initiative, with anticipated applications in future electric regional aircraft batteries. Furthermore, Canatu secured an order exceeding €5 million from FST for the manufacturing of EUV (Extreme Ultraviolet) pellicles for semiconductor production. EUV lithography demands pellicles with extremely high performance to protect masks from contamination while transmitting EUV light, and nanocarbon is key to meeting these stringent requirements.

### Background & Context

The nanocarbon market comprises diverse forms such as graphene, carbon nanotubes, fullerenes, and carbon black, with each material offering unique value in specific niche markets. However, CNTs, particularly SWCNTs, lead the market by enabling performance enhancements unattainable with traditional materials, owing to their unique structure and properties. Key industries like automotive, aerospace, and electronics are accelerating investment in and adoption of nanocarbon materials as they pursue lightweighting, improved durability, and enhanced functionality.

## Strategic Significance & Outlook

The market dominance of CNTs is projected to continue, with growth driven particularly by the proliferation of electric vehicles, advancements in renewable energy storage, and the development of cutting-edge electronics in 5G/6G communications and AI-related devices. Technological innovations and participation in large-scale projects by companies like OCSiAl and Canatu will open new application areas for nanocarbon materials and expand market size. In the future, these materials hold the potential to contribute to solving societal challenges across a broader range of sectors, including infrastructure, healthcare, and environmental technologies.

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Source: <https://www.datamintelligence.com/research-report/nanocarbon-market>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #06 Graphene Semiconductor: Georgia Tech's 10x faster specs vs silicon

Published October 05, 2026   Tech Briefs (Originally published in Nature)   USA

## OVERVIEW

Researchers at Georgia Tech have created the world's first functional semiconductor from graphene, overcoming the long-standing 'bandgap' problem that has plagued graphene research for decades. This breakthrough enables the graphene semiconductor to switch on and off, a fundamental requirement for electronic devices. The new material exhibits electron mobility 10 times higher than that of silicon, promising dramatically faster computing capabilities.

### Key Findings

Researchers at Georgia Tech have successfully engineered the world's first functional semiconductor derived from graphene, a monumental achievement poised to redefine the future of electronics. This breakthrough addresses the persistent 'bandgap' problem that has hindered graphene's semiconductor applications for decades, finally enabling graphene to function as an on-off switch for electronic signals. This newly developed graphene semiconductor demonstrates electron mobility approximately 10 times greater than that of traditional silicon, promising a significant acceleration in computing speeds.

### Technical / Clinical Details

The research team devised a method to artificially induce a bandgap in graphene sheets through precise control of their orientation and structural configuration. A bandgap is a critical property for semiconductors, enabling them to control the flow of electrical current (on-off switching); native graphene lacks this, rendering it unsuitable for direct semiconductor applications. The novel graphene structure facilitates significantly faster movement of charge carriers, achieving electron mobilities well exceeding 10,000  $\text{cm}^2/\text{Vs}$ , compared to silicon's typical mobility of around 1,000  $\text{cm}^2/\text{Vs}$ . This enhanced mobility is key to its high-speed performance.

### Background & Context

Silicon has been the bedrock of the semiconductor industry, but its physical limitations are becoming increasingly apparent, driving the demand for faster and more efficient materials. Graphene, often hailed as a 'wonder material' due to its extraordinary electrical properties, has held immense promise as a next-generation electronic material. However, the absence of a bandgap has been a major bottleneck, preventing its practical application in semiconductor devices. This current breakthrough shatters that technical barrier, positioning graphene as a viable, potentially superior, alternative to silicon.

## Strategic Significance & Outlook

This graphene semiconductor is poised to revolutionize next-generation microprocessors, ultra-high-speed transistors, high-frequency devices, and even quantum computing technologies, offering a leap in performance. At a time when performance gains from silicon-based devices are decelerating, graphene could help sustain Moore's Law and drive new innovations in fields such as AI, big data processing, and high-speed communication. While challenges remain for commercialization, this discovery marks a critical milestone towards the commercial realization of graphene electronics, setting the stage for more powerful and energy-efficient electronic systems globally.

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Source: <https://www.techbriefs.com/component/content/article/55969-the-first-functional-semiconductor-made-from-graphene>

Collected: October 09, 2026 | Automated Research System (Gemini API)

## #07 Perovskite Solar Cells: 34.71% efficiency specs for underwater use

Published October 01, 2026    Physics World (Originally detailed in Joule)    Unknown



### OVERVIEW

A research team has developed a polymer-tuned broadband perovskite solar cell designed to efficiently capture blue-green light prevalent in deep-sea environments. This innovative underwater solar cell achieved a record-breaking power conversion efficiency of 34.71% at a simulated depth of 10 meters. The device also demonstrated a certified efficiency of 16.79% under standard terrestrial light and is projected to retain 80% of its initial efficiency after approximately 5.49 years of continuous underwater operation, poised to revolutionize power for marine observation and underwater IoT devices.

### Key Findings

Researchers have successfully developed a polymer-tuned broadband perovskite solar cell capable of efficiently harnessing the blue-green light spectrum dominant in deep-sea environments. This groundbreaking underwater solar cell achieved an unprecedented power conversion efficiency of 34.71% at a simulated depth of 10 meters, significantly surpassing previous benchmarks. Furthermore, the device exhibits a certified efficiency of 16.79% under standard terrestrial illumination and is predicted to maintain 80% of its initial efficiency for approximately 5.49 years of continuous underwater operation, promising to transform power solutions for marine observation and submerged IoT applications.

### Technical / Clinical Details

The core innovation behind this underwater solar cell lies in the precise tuning of the perovskite layer composition and interfaces with specific polymers. Unlike terrestrial light, light penetrating deeper into the ocean is predominantly in the blue-green wavelength range. The research team optimized the perovskite material's bandgap and light absorption properties to maximize photon harvesting and conversion into electricity within this specific spectral window. The incorporation of polymers enhances the stability of the perovskite crystals, mitigating degradation in the aqueous environment and ensuring long-term performance. The projected operational lifetime of 5.49 years represents a substantial advance over existing underwater power sources.

### Background & Context

The growing demand for autonomous sensors, observation equipment, and communication buoys in marine environments has highlighted significant challenges in providing reliable power to underwater IoT devices. Conventional battery-powered systems necessitate frequent replacement or recharging, incurring high operational costs and logistical complexities. Terrestrial solar cells are unsuitable for underwater use due to their inability to withstand the unique light spectrum, pressure, and corrosive properties of the ocean. This research addresses these limitations by offering a high-efficiency, long-lifetime solar cell specifically tailored for the harsh underwater environment, enhancing the autonomy of devices in marine science, defense, and resource exploration.

## Strategic Significance & Outlook

The 34.71% power conversion efficiency at 10 meters depth marks a revolutionary advancement in underwater power generation capabilities. This technology opens up the possibility of powering submerged devices for years without the need to return to charging stations. Future applications are extensive, encompassing marine robotics, autonomous underwater vehicles (AUVs), subsea cable monitoring systems, and deep-sea exploration probes. Further development of this technology could provide critical infrastructure for deepening humanity's understanding of the oceans and facilitating sustainable marine resource utilization on a global scale.

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Source: <https://now.solar/2026/10/01/polymer-tuned-perovskite-creates-high-efficiency-underwater-solar-cells-physics-world/>

Collected: October 09, 2026 | Automated Research System (Gemini API)

## #08 Hybrid Nanomaterial: 4-in-1 specs for pollutant and B6 detection

Published October 05, 2026   Scienmag (Originally published in Environmental Geochemistry and Health)   Unknown



### OVERVIEW

A single, novel hybrid nanomaterial has been developed that simultaneously exhibits photocatalytic activity for degrading organic pollutants under visible light and high-sensitivity electrochemical detection of essential Vitamin B6. This '4-in-1' material combines ZnO, NiO, WO<sub>3</sub>, and graphitic carbon nitride via a simple synthetic route. It promises innovative applications in both water treatment and food safety, marking a significant advance in environmental monitoring and healthcare technologies.

### Key Findings

A single, innovative hybrid nanomaterial has been developed that delivers a remarkable '4-in-1' functionality, simultaneously degrading organic pollutants under visible light and electrochemically detecting essential Vitamin B6 with high sensitivity. This breakthrough unifies two critical applications – environmental remediation and food safety analysis – within a single, easily synthesizable nanoplatform.

### Technical / Clinical Details

The developed nanomaterial is a hybrid composite comprising zinc oxide (ZnO), nickel oxide (NiO), tungsten trioxide (WO<sub>3</sub>), and graphitic carbon nitride (g-C<sub>3</sub>N<sub>4</sub>). This specific combination enables robust photocatalytic activity in the visible light spectrum, efficiently decomposing common organic dyes like methylene blue. Concurrently, the ZnO and NiO components serve as highly effective electrochemical sensors, capable of sensitive and rapid detection of pyridoxine (Vitamin B6) in food and biological samples, achieving a detection limit of 0.28 nM. The synthesis pathway for this composite is noted for its simplicity, indicating strong potential for scalable production beyond laboratory settings.

### Background & Context

The dual challenges of ubiquitous organic pollutant contamination in water systems and the necessity for accurate nutritional monitoring in food present significant societal and health concerns. Traditionally, addressing these issues has required separate, often complex and costly, material systems and analytical methods. The integration of both pollutant degradation and vital nutrient sensing into one nanomaterial offers a paradigm shift, streamlining processes and potentially reducing the infrastructural burden for both environmental monitoring and public health initiatives.

## Strategic Significance & Outlook

This multi-functional nanomaterial holds substantial promise for future smart environmental sensors and integrated water purification systems. Its ability to simultaneously tackle both degradation and detection could lead to more efficient, low-cost solutions, particularly in regions facing challenges in water quality and food security. Furthermore, its potential for miniaturization opens avenues for portable diagnostic devices for point-of-care or field-based food quality assessment. Future work will likely focus on enhancing long-term stability and validating performance in diverse, real-world matrices to fully realize its expansive application potential.

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Source: <https://scienmag.com/four-in-one-nanomaterial-cleans-water-and-spots-vitamin-b6-in-one-go/>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #09 LSU Gas Leak Detection: 95% accuracy specs via optical fiber

Published October 01, 2026   Reville   USA



## OVERVIEW

Researchers at Louisiana State University (LSU) have developed a gas leak detection system integrating optical fiber sensors and nanomaterials, achieving an impressive 95% accuracy. This innovative system precisely identifies and monitors gas leaks while blocking noise and humidity, potentially leading to significant reductions in accidents, human casualties, and economic costs. This represents a crucial advancement in enhancing safety standards within the oil and gas industry.

### Key Findings

Researchers at Louisiana State University (LSU) have developed a sophisticated gas leak detection system that integrates optical fiber sensors with nanomaterials, achieving a high accuracy rate of 95% in identifying and monitoring gas leaks. This innovation is poised to significantly save lives and reduce economic costs associated with gas leak incidents.

### Technical / Clinical Details

The system developed by LSU utilizes optical fiber cables as the primary sensing elements, designed to detect subtle changes in light signals induced by the presence of gas. The key innovation lies in the incorporation of nanomaterials within or alongside the optical fiber cables. These nanomaterials play a crucial role in filtering out environmental noise, such as vibrations, and blocking humidity, factors that typically compromise the accuracy of conventional sensors. This strategic integration allows the system to maintain its high 95% detection accuracy even under challenging environmental conditions. The system offers real-time monitoring capabilities, enabling rapid detection of even minute gas leaks and issuing immediate alerts to operators.

### Background & Context

Gas leaks pose significant safety risks across various sectors, including the oil and gas industry, chemical plants, and urban gas distribution networks. Such leaks can lead to catastrophic explosions, fires, poisoning incidents, resulting in severe loss of life, environmental damage, and substantial economic losses. Existing gas detection systems often face limitations in terms of sensitivity, selectivity, durability, and cost-effectiveness. There has been a pressing need for more advanced monitoring systems that can cover large areas and maintain high accuracy under adverse conditions. LSU's technology directly addresses these challenges, promising to enhance safety in critical infrastructure operations.

## Strategic Significance & Outlook

This LSU gas leak detection system has the potential to revolutionize safety management in critical infrastructure, including oil and gas pipelines, storage facilities, chemical processing plants, and urban utility networks. Its high detection accuracy of 95% and resilience to noise and humidity will reduce false alarms and enable more reliable operations. Future efforts will focus on evaluating its long-term durability, scalability, and cost-efficiency for large-scale real-world deployment. The widespread adoption of this technology is expected to contribute significantly to improving industrial safety and mitigating environmental impacts from accidental gas releases.

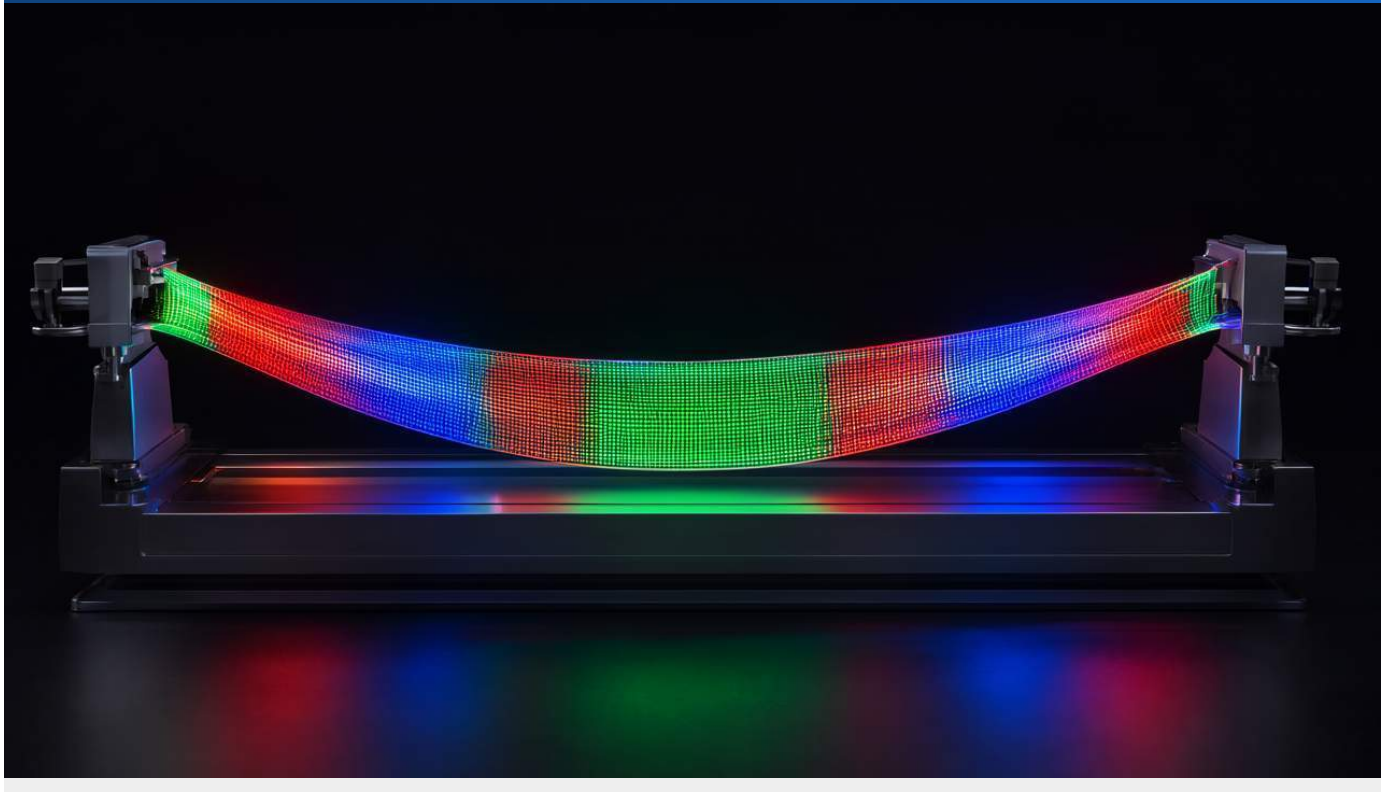
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Source: <https://lsureveille.com/289239/tigertv/lsu-makes-major-breakthrough-in-detecting-gas-leaks/>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #10 DGIST Quantum Dot Display: Specs for world's brightest stretchable

Published October 07, 2026    Mirage News / Nature Nanotechnology    South Korea



## OVERVIEW

A research team at DGIST (Daegu Gyeongbuk Institute of Science and Technology) has successfully developed the world's brightest stretchable quantum dot display. This groundbreaking achievement was published online in Nature Nanotechnology, a leading journal in the nanotechnology field, in September 2026. The developed display combines superior stretchability with high brightness, significantly contributing to the realization of next-generation display technology for flexible electronics and wearable devices. This technology addresses market demands for high-resolution imaging and enhanced wearer comfort.

### Key Findings

A research team at DGIST (Daegu Gyeongbuk Institute of Science and Technology) has successfully developed the world's brightest stretchable quantum dot display. This innovative technology significantly elevates the performance limits of existing flexible displays and is poised to open new possibilities, particularly in fields demanding high flexibility such as wearable devices and electronic skin patches. The findings were published online in September 2026 in the prestigious scientific journal, 'Nature Nanotechnology.'

### Technical / Clinical Details

The developed stretchable quantum dot display achieves both excellent elasticity and high luminescence efficiency through a combination of proprietary ligand design and nanostructure control techniques. Conventional stretchable displays have faced challenges where emissive properties degrade or structures get damaged under stretching or bending. DGIST's technology overcomes these issues, enabling the display to exhibit stretchability of up to several hundred percent while maintaining uniform brightness and color purity per pixel. Specifically, quantum dots are uniformly dispersed within a special elastomer matrix, designed to prevent damage to the emissive layer under stress. This innovative material engineering and device design combine unprecedented brightness with exceptional durability.

### Background & Context

The flexible electronics market is rapidly expanding across diverse sectors, including smartphones, smartwatches, and VR/AR devices. Among these, display stretchability is considered a key technology that can fundamentally alter device wearability and form factor freedom. While conventional flexible displays have primarily accommodated bending and folding, DGIST's technology introduces a new dimension of 'stretchability,' enabling more natural and intuitive user interfaces and integration with biometric sensors. This technology can facilitate a variety of previously impossible applications, such as medical patches, smart textiles, and robotic skins, bringing significant economic impact to related industries.

## Strategic Significance & Outlook

The world's brightest stretchable quantum dot display developed by DGIST is set to drive technological innovation in the flexible electronics sector. Future research and development will focus on establishing manufacturing processes for mass production and evaluating long-term reliability under various environmental conditions.

Commercialization of this technology could contribute to 'invisible computing,' seamlessly integrating into our living spaces and bodies, and potentially redefining human-machine interface concepts. It is expected to create entirely new markets, particularly for direct-skin health monitoring devices and information display surfaces that can freely change shape.

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Source: <https://www.miragenews.com/dgist-develops-brightest-stretchable-quantum-1755916/>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #11 Canon Nanoimprint: 10x energy reduction for 2026 mass production

Published October 01, 2026 Canon Global Japan



## OVERVIEW

Canon announced its collaboration with customers to optimize mass production lines for its next-generation nanoimprint lithography (NIL) systems. This technology promises a significant tenfold reduction in power consumption during the exposure phase of semiconductor manufacturing. NIL is positioned to overcome miniaturization challenges, enhancing both sustainability and cost-efficiency within the semiconductor industry.

### Key Findings

Canon has revealed its proactive engagement with customers to optimize mass production lines for its advanced nanoimprint lithography (NIL) systems. This initiative highlights the technology's potential to drastically cut power consumption by approximately 90% during the critical exposure process in semiconductor manufacturing, thereby offering substantial improvements in sustainability and cost-efficiency for the miniaturizing semiconductor industry.

### Technical / Clinical Details

Nanoimprint lithography operates by directly transferring patterns, leading to a simpler system architecture compared to complex optical lithography tools. This inherent simplicity is key to its dramatic energy savings, particularly in the exposure step. Through rigorous evaluation and optimization with customers, Canon is validating NIL systems' capability to achieve an approximate 10-fold improvement in energy efficiency over conventional exposure technologies. This efficiency not only translates to reduced manufacturing costs but also significantly lowers the environmental footprint of the semiconductor industry. NIL technology is compatible with state-of-the-art 2nm process nodes, enabling the formation of high-density, uniform patterns with high fidelity.

### Background & Context

The semiconductor manufacturing sector is experiencing ever-increasing demands for higher performance and greater miniaturization, which has simultaneously led to a critical challenge: escalating power consumption during manufacturing processes, especially lithography. Existing advanced exposure technologies like EUV, while high-performing, entail prohibitive capital expenditure, high operational costs, and immense power requirements. In this context, Canon's NIL technology presents a clear advantage in low power consumption, positioning it as an attractive alternative for semiconductor manufacturers. The industry-wide push for sustainable manufacturing processes further elevates the significance and anticipation for NIL's broader adoption.

## Strategic Significance & Outlook

The progress in mass production line optimization achieved through Canon's collaboration with its customers is expected to accelerate the widespread adoption of NIL technology. Moving forward, NIL is poised to enable the fabrication of energy-efficient semiconductors for a broad range of applications, including mobile devices, AI accelerators, and data centers. The maturation of this technology promises to drive down semiconductor manufacturing costs and reduce environmental impact, providing an essential foundation for the evolution of next-generation electronics.

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Source: <https://global.canon/en/technology/canon-tech/interview/nanoimprint/>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #12 GMG Graphene Batteries: 1,000 cycle life and 6-minute charge specs

Published October 08, 2026   Graphene Manufacturing Group   Australia



## OVERVIEW

Graphene Manufacturing Group (GMG) announced a significant performance leap for its G@CELLS graphene batteries, achieving a 48% increase in energy density and doubling cycle life to 1,000 cycles with 94% energy efficiency during 6-minute fast charging. These advancements surpass conventional LTO batteries and address critical challenges in rapid charging for electric vehicles and large-scale energy storage systems. The development positions graphene batteries to become a new benchmark in battery technology, accelerating EV adoption and renewable energy integration.

### Key Findings

Graphene Manufacturing Group (GMG) has announced a significant breakthrough for its G@CELLS graphene aluminum-ion batteries, demonstrating a 48% increase in energy density, a doubling of cycle life to 1,000 cycles, and 94% energy efficiency with a remarkable 6-minute fast charge capability.

### Technical Details

This performance enhancement stems from GMG's proprietary high-purity graphene manufacturing techniques and its expertise in integrating this material into advanced battery cell designs. G@CELLS leverage the unique properties of graphene combined with aluminum to achieve superior charging speeds and stability compared to traditional lithium-ion batteries. Specifically, the new generation outperforms conventional Lithium Titanium Oxide (LTO) batteries in energy density, cycle longevity, and rapid charging kinetics. The ability to achieve near-full charge in just six minutes is a testament to maximizing graphene's ultrafast electron transport properties and large surface area.

### Background & Context

The burgeoning electric vehicle (EV) market and the accelerated deployment of renewable energy sources are driving an immense demand for improved battery performance, particularly in terms of fast charging, energy density, and extended lifespan. Traditional lithium-ion batteries face inherent limitations in these areas, necessitating the exploration of novel materials and architectures. Graphene batteries, with their exceptional conductivity and stability, have long been considered a leading candidate for next-generation battery technology. GMG's latest achievement validates this potential, paving the way for significantly reduced EV charging times and more efficient grid-scale energy storage solutions.

## Strategic Significance & Outlook

The commercialization of G<sup>®</sup>CELLS is expected to alleviate key barriers to EV adoption—range anxiety and long charging times—thereby accelerating the global transition to electric mobility. Furthermore, in large-scale energy storage systems, these batteries could play a pivotal role in efficiently smoothing out intermittent power supplies from renewable sources. GMG plans to continue optimizing performance and scaling up manufacturing, aiming for graphene batteries to become a core technology in a sustainable energy future.

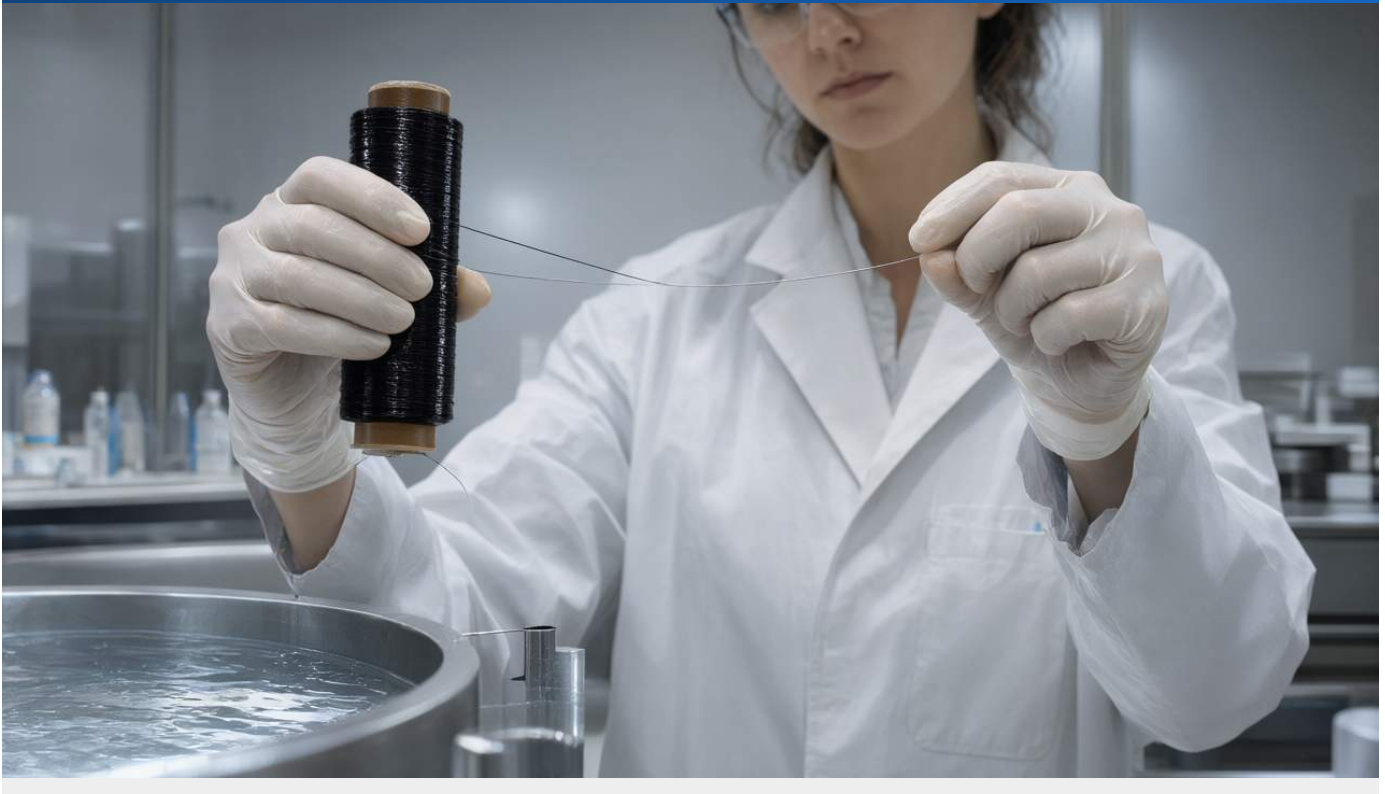
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Source: <https://graphenemg.com/gmg-announces-48-increase-in-energy-density-doubling-of-cycle-life-and-94-energy-efficiency-for-6-minute-fast-charge/>

Collected: October 09, 2026 | Automated Research System (Gemini API)

# #13 Zhejiang University Graphene Fiber: 5.9 GPa tensile strength specs

Published October 06, 2026   Seoul Economic Daily (via KAIST commentary)   South Korea



## OVERVIEW

Zhejiang University researchers have successfully developed a high-performance graphene fiber, achieving an impressive tensile strength of 5.9 Gigapascals (GPa) and thermal conductivity of 1,720 Watts/meter·Kelvin (W/m·K) by highly orienting graphene sheets in a high-viscosity glycerol dispersion. This breakthrough significantly advances the industrial application of graphene fibers. In response, KAIST researchers published a News & Views article in *Nature Materials*, summarizing 15 years of progress in graphene fiber technology since the discovery of graphene oxide liquid crystals.

### Key Findings

A research team at Zhejiang University has successfully developed ultra-high-performance graphene fibers boasting a remarkable tensile strength of 5.9 Gigapascals (GPa) and a thermal conductivity of 1,720 Watts/meter·Kelvin (W/m·K) through a novel high-viscosity glycerol-based method. This achievement significantly surpasses the performance of previous graphene fibers, paving the way for their practical application as next-generation high-strength, high-thermal conductivity materials.

### Technical Details

The Zhejiang University researchers achieved this by uniformly dispersing graphene oxide in high-viscosity glycerol, creating a 'liquid crystal' state where graphene sheets are highly oriented within the solution. By spinning from this highly oriented liquid crystal, fibers with an exceptionally aligned structure along the fiber axis were obtained. This dense and ordered structure yielded the record-breaking mechanical and thermal properties of 5.9 GPa tensile strength and 1,720 W/m·K thermal conductivity. This technique allows for the production of more uniform and defect-free fibers compared to conventional solution spinning methods, leading to a substantial enhancement in graphene fiber performance.

Following this announcement, a research team from KAIST (Korea Advanced Institute of Science and Technology) published a commentary titled 'Graphene Fibers for Beyond' in the News & Views section of Nature Materials. This article reviewed the evolution of graphene fiber technology over the past 15 years since the discovery of graphene oxide liquid crystals, positioning Zhejiang University's achievement as the latest pinnacle. The KAIST commentary highlights the diverse application potential of graphene fibers, ranging from high-performance sportswear to artificial muscles, and even aerospace materials and biomedical implants.

## Background & Context

Graphene has long been hailed as a 'wonder material,' yet realizing its exceptional properties (high strength, electrical conductivity, thermal conductivity) in macro-scale fibers and films for practical applications has presented numerous challenges. Crucially, techniques for uniformly orienting and defect-freely bonding graphene sheets have been paramount. Zhejiang University's breakthrough offers a decisive solution to this challenge, potentially marking a significant turning point for graphene fibers to transition from laboratory research to industrial application. Materials combining high strength and thermal conductivity hold the potential to bring about revolutionary changes in diverse industries, including aerospace, where lightweighting is critical; high-performance sports equipment; electronics, where thermal management is key; and even the medical field, where biocompatibility is essential.

## Strategic Significance & Outlook

The high-performance graphene fibers developed by Zhejiang University enable the creation of products with capabilities previously unattainable with existing materials. Potential applications include next-generation bulletproof vests, lightweight and robust aerospace components, efficient heat dissipation solutions, and even artificial muscles that mimic human movement. As suggested by the KAIST review, future research and development in graphene fibers will push the boundaries of materials science and engineering, becoming essential foundational materials for a sustainable and high-performance society. Establishing mass production techniques and reducing costs will be the next crucial challenges.

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Source: <https://en.sedaily.com/technology/2026/10/07/graphene-moves-from-lab-to-gymnasts-uniforms-and-artificial>

# #14 InGaAs Quantum Dots: 90% photon interference for 2026 computing

Published October 03, 2026    Physical Review Letters (via ScienceDaily summary)    United States



## OVERVIEW

A research team has successfully boosted quantum photon interference visibility to an impressive 90% by integrating indium gallium arsenide (InGaAs) quantum dots within optical microcavities. This breakthrough leverages the quantum dots' inherent ability to confine electron excitations and behave as artificial atoms. The 90% visibility significantly enhances the performance of photon sources critical for quantum communication and computing, enabling more robust qubit generation and improved system stability. Published in Physical Review Letters, this discovery opens new avenues for advanced quantum technologies.

### InGaAs Quantum Dots Achieve 90% Quantum Photon Interference Visibility, Driving Quantum Technology Forward

A research team has successfully elevated quantum photon interference visibility to an astonishing 90% by strategically embedding indium gallium arsenide (InGaAs) quantum dots within optical microcavities. This groundbreaking achievement capitalizes on the quantum dots' intrinsic property to confine electron excitations, thereby mimicking the behavior of artificial atoms. A 90% interference visibility represents a critical advance in developing high-fidelity photon sources for both quantum communication and quantum computing applications.

#### Technical and Experimental Details

- **Role of Quantum Dots:** InGaAs quantum dots, due to their electronic structure, serve as ideal quantum emitters capable of generating single photons with high efficiency. Their ability to confine electrons and holes within a minute semiconductor structure, leading to discrete energy levels, makes them excellent single-photon sources.
- **Enhancement via Optical Microcavities:** By positioning quantum dots within precisely engineered optical microcavities, the spontaneous emission of photons from the quantum dots is guided and enhanced, significantly improving the purity and indistinguishability of the emitted photons. The microcavity amplifies specific wavelengths while suppressing noise, thereby elevating the quality of quantum interference.
- **90% Interference Visibility:** Achieving 90% photon interference visibility implies that the generated photons are almost perfectly indistinguishable. This is a crucial prerequisite for multi-photon quantum information processing protocols, such as Bell-state measurements and linear optical quantum computing. This level of photon coherence was previously challenging to attain with conventional systems.

## Background and Industry Context

In the fields of quantum communication and quantum computing, a persistent challenge has been the generation of photons, which serve as qubits, with high purity and indistinguishability. Low photon indistinguishability degrades the fidelity of quantum gate operations and increases quantum error rates. This latest achievement offers a potential solution to this fundamental problem, paving the way for the construction of larger-scale, more error-tolerant quantum systems.

## Strategic Significance and Outlook

This semiconductor device, capable of achieving 90% photon interference visibility, is poised to become a foundational technology for next-generation quantum communication networks and quantum computers. Specifically, it will directly contribute to enhancing the security of Quantum Key Distribution (QKD) systems and facilitate the development of scalable photon-based quantum computing platforms. The technology is also envisioned for applications in other quantum technology domains, including quantum sensing and quantum imaging, potentially leading to the realization of high-efficiency single-photon sources operating at room temperature.

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Source: <https://www.thebrighterside.news/post/a-tiny-semiconductor-device-lifts-quantum-photon-interference-visibility-to-90/>