

TROY TECHNICAL

ADHESIVES & SEALANTS

WEEKLY REPORT

October 10 - October 16, 2026 | Issue 2026-W41

**Bond-line performance, cure process,
durability and cross-industry qualification**

10

ANALYZED ARTICLES

8

PRIORITY THEMES

Issued 2026-10-16 | English edition | fixed approved cover artwork



Adhesives & Sealants: the boundary moved from isolated claims to qualification evidence

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

SIGNAL 01 | BUSINESS / RULES

Sumitomo Bakelite: Production Expansion for MUF and Compression Materials

Primary-source report: Sumitomo Bakelite is expanding production capacity for SUMIKONTM EME mold underfill (MUF) and compression-molding granules at its Suzhou, China, and Singapore sites.

SIGNAL 02 | SYSTEM / ADOPTION

Laser-Pyrolyzed PDMS: Monolithic Antifouling Bioelectronics Specs

Primary-source report: Researchers have developed a one-step direct laser writing strategy to transform pristine PDMS into a superhydrophobic silicon oxycarbide (SiOC)/graphenic composite. This monolithic platform achieves a 94.47% reduction in E.

SIGNAL 03 | TECH / PROCESS

Fluorine-Free Battery Binder: UC San Diego's Sustainable Specs

Collected report (not independently verified): Researchers from the University of California San Diego and Toyota Research Institute of North America have developed a water-processable, fluorine-free battery binder.

SIGNAL 04 | TECH / PROCESS

Henkel BONDERITE: Productivity Gains in Aluminium Anodising

Collected report (not independently verified): Henkel has introduced a suite of BONDERITE technologies for aluminium anodising that optimize degreasing, etching, and sealing processes.

DECISION

Focus this week's management attention on bond-line performance, cure process, durability and cross-industry qualification. Move only when the linked evidence can be reproduced under your own operating conditions.

THREE MANAGEMENT MOVES

1. Buyers: evaluate the complete joint or sealed system under process and lifetime conditions.
2. Suppliers: provide substrate preparation, cure window, rework, aging and failure-analysis evidence.
3. Executives: track adhesion aging, cure variability, outgassing, regulation, repair and scale.

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

~2x A02	SOURCE-BOUND CONDITION Sumitomo planned MUF capacity, not output
~3x A02	SOURCE-BOUND CONDITION Planned compression-granule capacity
94.47% A05	SOURCE-BOUND CONDITION PDMS E. coli attachment reduction in assay
157 deg A05	SOURCE-BOUND CONDITION Laser-treated PDMS water contact angle
OPEN A02	SOURCE-BOUND CONDITION Application-specific aging and process window, reproducibility and deployment terms remain unproven. Published claims are not customer-qualified performance.

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

Chemistry
P01/P06

Primary-source report: Sumitomo Bakelite is expanding production capacity for SUMIKONTM EME mold underfill (MUF) and compression-molding granules at its Suzhou, China, and Singapore sites.

2

Formulation
P02/P07

Primary-source report: Researchers have developed a one-step direct laser writing strategy to transform pristine PDMS into a superhydrophobic silicon oxycarbide (SiOC)/graphenic composite.

3

Application & cure
P03/P08

Collected report (not independently verified): Researchers from the University of California San Diego and Toyota Research Institute of North America have developed a water-processable, fluorine-free battery binder.

4

Qualified product
P04/P01

Collected report (not independently verified): Henkel has introduced a suite of BONDERITE technologies for aluminium anodising that optimize degreasing, etching, and sealing processes.

5

Repair & circularity
P05/P02

Collected report (not independently verified): Henkel has developed a next-generation zirconium-based, phosphate-free cleaner-coater, BONDERITE M-NT 41040, to replace traditional iron phosphate technologies.

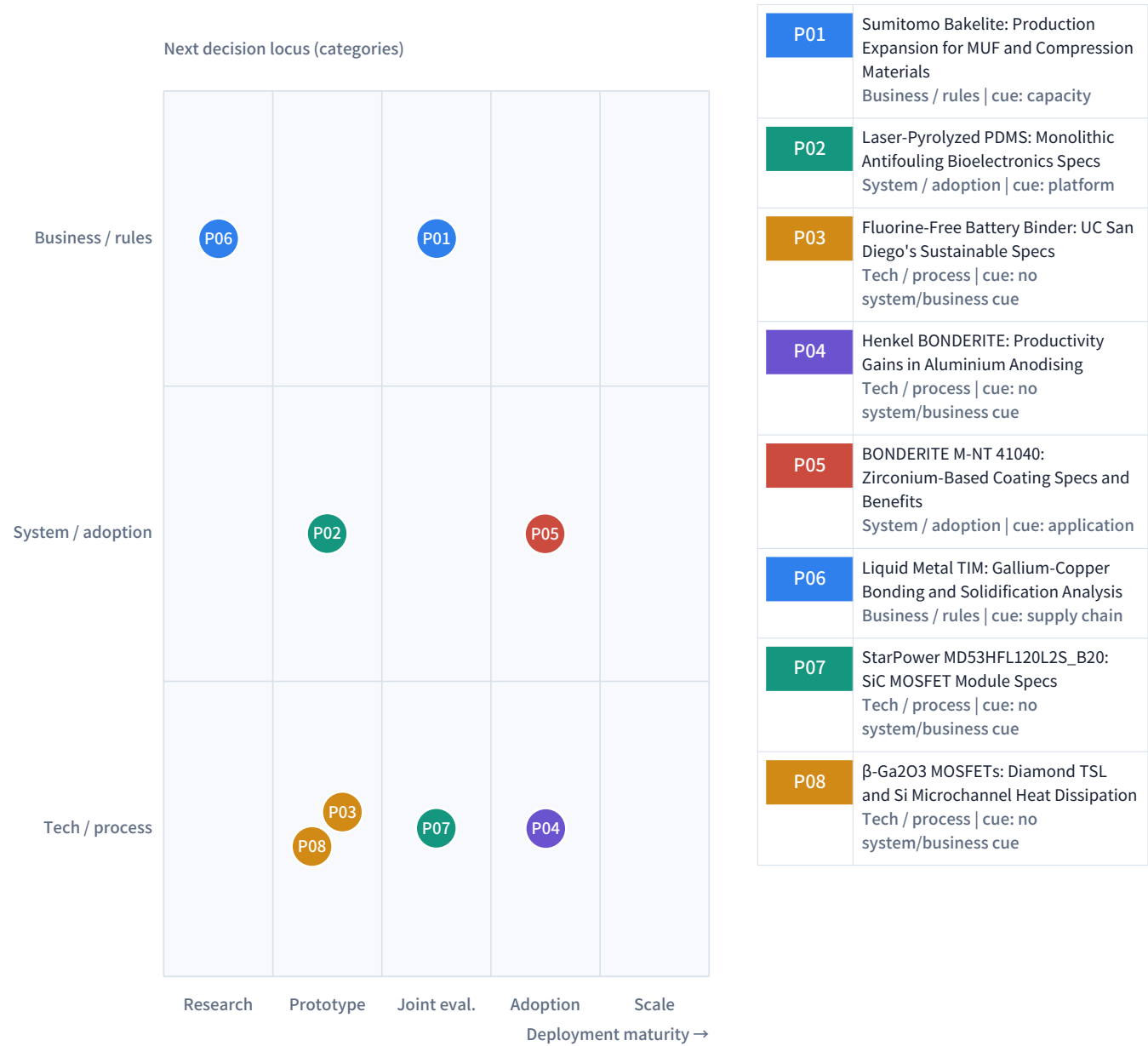
EVIDENCE REQUIRED AT EACH HANDOFF

Chemistry to Formulation	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck adhesion aging, cure variability, outgassing, regulation, repair and scale.
Formulation to Application & cure	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck adhesion aging, cure variability, outgassing, regulation, repair and scale.
Application & cure to Qualified product	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck adhesion aging, cure variability, outgassing, regulation, repair and scale.
Qualified product to Repair & circularity	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck adhesion aging, cure variability, outgassing, regulation, repair and scale.

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented adhesion aging, cure variability, outgassing, regulation, repair and scale.

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.

For legibility, scores of 18 or below use an 18-pt bubble diameter; underlying scores are unchanged.

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

P01

Sumitomo Bakelite: Production Expansion for MUF and Compression Materials

A02 | Business / rules | Joint evaluation

2026-10-09

FACT

Primary-source report: Sumitomo Bakelite is expanding production capacity for SUMIKONTM EME mold underfill (MUF) and compression-molding granules at its Suzhou, China, and Singapore sites. These investments, combined with the acquisition of Kyocera Corporation's chemical business, are designed to meet rising demand for advanced semiconductor packaging in generative AI and communications satellites.

WHY IT MATTERS

In practical terms, Sumitomo Bakelite needs separate tests of interface function and aging and process window before the result becomes an adoption case.

BUSINESS READ

For Sumitomo Bakelite, compare interface function and aging and process window under the same application conditions. Request source protocols before extrapolating to customer use. This is an editorial inference.

ACTION

Within 30 days, R&D and quality should compare Sumitomo Bakelite on interface function against a baseline; deliver an acceptance and stop-rule sheet.

UNKNOWN

Application-specific aging and process window, reproducibility and deployment terms remain unproven. Published claims are not customer-qualified performance.

EDITORIAL SCORE 18/25 | MATURITY 3/5 | DECISION LOCUS: BUSINESS / RULES

P02

Laser-Pyrolyzed PDMS: Monolithic Antifouling Bioelectronics Specs

A05 | System / adoption | Prototype

2026-10-12

FACT

Primary-source report: Researchers have developed a one-step direct laser writing strategy to transform pristine PDMS into a superhydrophobic silicon oxycarbide (SiOC)/graphenic composite. This monolithic platform achieves a 94.47% reduction in E. coli attachment while enabling rapid interfacial charge transfer via localized electrowetting.

WHY IT MATTERS

In practical terms, Laser-Pyrolyzed PDMS needs separate tests of interface function and aging and process window before the result becomes an adoption case.

BUSINESS READ

For Laser-Pyrolyzed PDMS, compare interface function and aging and process window under the same application conditions. Request source protocols before extrapolating to customer use. This is an editorial inference.

ACTION

Within 30 days, R&D and quality should compare Laser-Pyrolyzed PDMS on interface function against a baseline; deliver an acceptance and stop-rule sheet.

UNKNOWN

Application-specific aging and process window, reproducibility and deployment terms remain unproven. Published claims are not customer-qualified performance.

EDITORIAL SCORE 17/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

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

P03

Fluorine-Free Battery Binder: UC San Diego's Sustainable Specs

A01 / A10 | Tech / process | Prototype

2026-10-16

FACT

Collected report (not independently verified): Researchers from the University of California San Diego and Toyota Research Institute of North America have developed a water-processable, fluorine-free battery binder. This innovation reduces energy costs by 6.9%-9.3% and lowers greenhouse gas emissions by 7.2% during recycling, enabling a more sustainable circular economy for lithium-ion batteries.

WHY IT MATTERS

In practical terms, Fluorine-Free Battery Binder needs separate tests of interfacial adhesion and cure window before the result becomes an adoption case.

BUSINESS READ

For Fluorine-Free Battery Binder, compare interfacial adhesion and cure window under the same application conditions. Request source protocols before extrapolating to customer use. This is an editorial inference.

ACTION

Within 30 days, R&D and quality should compare Fluorine-Free Battery Binder on interfacial adhesion against a baseline; deliver an acceptance and stop-rule sheet.

UNKNOWN

Application-specific cure window, reproducibility and deployment terms remain unproven. Confirm the original primary record.

EDITORIAL SCORE 14/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P04

Henkel BONDERITE: Productivity Gains in Aluminium Anodising

A03 | Tech / process | Product adoption

2026-10-12

FACT

Collected report (not independently verified): Henkel has introduced a suite of BONDERITE technologies for aluminium anodising that optimize degreasing, etching, and sealing processes. Key advancements include a nickel-free cold sealing additive and a hot sealing additive that increases productivity by at least 20 percent.

WHY IT MATTERS

In practical terms, Henkel BONDERITE needs separate tests of cell quality and mechanism and immune safety and reproducibility before the result becomes an adoption case.

BUSINESS READ

For Henkel BONDERITE, compare cell quality and mechanism and immune safety and reproducibility under the same application conditions. Request source protocols before extrapolating to customer use. This is an editorial inference.

ACTION

Within 30 days, R&D and quality should compare Henkel BONDERITE on cell quality and mechanism against a baseline; deliver an acceptance and stop-rule sheet.

UNKNOWN

Application-specific immune safety and reproducibility, reproducibility and deployment terms remain unproven. Confirm the original primary record.

EDITORIAL SCORE 17/25 | MATURITY 4/5 | DECISION LOCUS: TECH / PROCESS

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

P05

BONDERITE M-NT 41040: Zirconium-Based Coating Specs and Benefits

A04 | System / adoption | Product adoption

2026-10-12

FACT

Collected report (not independently verified): Henkel has developed a next-generation zirconium-based, phosphate-free cleaner-coater, BONDERITE M-NT 41040, to replace traditional iron phosphate technologies. The solution enables room-temperature application to reduce energy consumption and emissions while improving paint adhesion and corrosion protection.

WHY IT MATTERS

In practical terms, BONDERITE M-NT 41040 needs separate tests of interfacial adhesion and cure window before the result becomes an adoption case.

BUSINESS READ

For BONDERITE M-NT 41040, compare interfacial adhesion and cure window under the same application conditions. Request source protocols before extrapolating to customer use. This is an editorial inference.

ACTION

Within 30 days, R&D and quality should compare BONDERITE M-NT 41040 on interfacial adhesion against a baseline; deliver an acceptance and stop-rule sheet.

UNKNOWN

Application-specific cure window, reproducibility and deployment terms remain unproven. Confirm the original primary record.

EDITORIAL SCORE 17/25 | MATURITY 4/5 | DECISION LOCUS: SYSTEM / ADOPTION

P06

Liquid Metal TIM: Gallium-Copper Bonding and Solidification Analysis

A06 | Business / rules | Research

2026-10-16

FACT

Collected report (not independently verified): Electron microscope testing reveals that liquid metal thermal interface materials (TIM) do not dry out but instead react chemically with copper to form a solid compound. While nickel plating reduces the thickness of this layer by approximately 10 times, the process highlights critical material compatibility and supply chain risks for high-power density components.

WHY IT MATTERS

In practical terms, Liquid Metal TIM needs separate tests of interface function and aging and process window before the result becomes an adoption case.

BUSINESS READ

For Liquid Metal TIM, compare interface function and aging and process window under the same application conditions. Request source protocols before extrapolating to customer use. This is an editorial inference.

ACTION

Within 30 days, R&D and quality should compare Liquid Metal TIM on interface function against a baseline; deliver an acceptance and stop-rule sheet.

UNKNOWN

Application-specific aging and process window, reproducibility and deployment terms remain unproven. Confirm the original primary record.

EDITORIAL SCORE 15/25 | MATURITY 1/5 | DECISION LOCUS: BUSINESS / RULES

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

P07

StarPower MD53HFL120L2S_B20: SiC MOSFET Module Specs

A07 | Tech / process | Joint evaluation

2026-10-16

FACT

Collected report (not independently verified): StarPower Semiconductor has developed the MD53HFL120L2S_B20, a 1200 V, 120 A SiC MOSFET power module featuring a half-bridge topology. The module reduces conduction and switching losses to increase power density and lower cooling requirements in automotive and industrial applications.

WHY IT MATTERS

In practical terms, StarPower MD53HFL120L2S_B20 needs separate tests of interfacial adhesion and cure window before the result becomes an adoption case.

BUSINESS READ

For StarPower MD53HFL120L2S_B20, compare interfacial adhesion and cure window under the same application conditions. Request source protocols before extrapolating to customer use. This is an editorial inference.

ACTION

Within 30 days, R&D and quality should compare StarPower MD53HFL120L2S_B20 on interfacial adhesion against a baseline; deliver an acceptance and stop-rule sheet.

UNKNOWN

Application-specific cure window, reproducibility and deployment terms remain unproven. Confirm the original primary record.

EDITORIAL SCORE 16/25 | MATURITY 3/5 | DECISION LOCUS: TECH / PROCESS

P08

β-Ga2O3 MOSFETs: Diamond TSL and Si Microchannel Heat Dissipation

A08 | Tech / process | Prototype

2026-10-08

FACT

Collected report (not independently verified): Researchers have developed a hybrid thermal management strategy combining a diamond thermal spreading layer (TSL) with substrate-embedded silicon microchannels to mitigate self-heating in β-Ga2O3 MOSFETs. This approach reduces peak device temperature by approximately 55.6 K, achieving performance within 5 K of high-cost diamond microchannel solutions.

WHY IT MATTERS

In practical terms, β-Ga2O3 MOSFETs needs separate tests of interfacial adhesion and cure window before the result becomes an adoption case.

BUSINESS READ

For β-Ga2O3 MOSFETs, compare interfacial adhesion and cure window under the same application conditions. Request source protocols before extrapolating to customer use. This is an editorial inference.

ACTION

Within 30 days, R&D and quality should compare β-Ga2O3 MOSFETs on interfacial adhesion against a baseline; deliver an acceptance and stop-rule sheet.

UNKNOWN

Application-specific cure window, reproducibility and deployment terms remain unproven. Confirm the original primary record.

EDITORIAL SCORE 14/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

Playbook and 0-5 year roadmap

STAKEHOLDER	NOW 0-30 DAYS	NEXT 1-12 MONTHS	LATER 1-5 YEARS
Operating companies	evaluate the complete joint or sealed system under process and lifetime conditions	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	provide substrate preparation, cure window, rework, aging and failure-analysis evidence	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 adhesion aging, cure variability, outgassing, regulation, repair and scale.	Contract for capacity, quality, change notice, liability, alternatives and exit.	Diversify regional, technical and customer concentration risk.

ROADMAP

NOW 0-30 DAYS Evidence ledger Owner: Strategy + quality Deliverable: claim, source, condition, owner	NOW 0-30 DAYS Risk screen Owner: Procurement + legal Deliverable: unknowns, alternatives, stop	NEXT 1-12 MONTHS Joint qualification Owner: R&D + supplier Deliverable: process window and failure data
NEXT 1-12 MONTHS Commercial gate Owner: Business + finance Deliverable: unit economics and capacity	LATER 1-5 YEARS Platform strategy Owner: Executive team Deliverable: portfolio and interface roadmap	LATER 1-5 YEARS Service layer Owner: Operations + channel 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 01-10

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	Fluorine-Free Battery Binder: UC San Diego's Sustainable Specs	https://resource-recycling.com/e-scrap/2026/10/16/researchers-work-on-fluorine-free-battery-binder/
A02	Sumitomo Bakelite: Production Expansion for MUF and Compression Materials	https://www.sumibe.co.jp/english/topics/2026/it-materials/1007_01/index.html
A03	Henkel BONDERITE: Productivity Gains in Aluminium Anodising	https://next.henkel-adhesives.com/hr/en/articles/higher-productivity-ease-of-handling-and-no-nickel.html
A04	BONDERITE M-NT 41040: Zirconium-Based Coating Specs and Benefits	https://next.henkel-adhesives.com/sk/en/articles/new-generation-coatings.html
A05	Laser-Pyrolyzed PDMS: Monolithic Antifouling Bioelectronics Specs	https://www.oaepublish.com/articles/ss.2026.178
A06	Liquid Metal TIM: Gallium-Copper Bonding and Solidification Analysis	https://www.tomshardware.com/pc-components/cooling/experiment-shows-liquid-metal-tim-doesnt-dry-out-it-turns-solid-two-year-electron-microscope-test-finds-gallium-bonds-with-copper-coolers-and-nickel-plating-keeps-the-layer-about-10-times-thinner
A07	StarPower MD53HFL120L2S_B20: SiC MOSFET Module Specs	https://www.electronicsforu.com/news/sic-power-module-improves-high-voltage-efficiency
A08	β -Ga2O3 MOSFETs: Diamond TSL and Si Microchannel Heat Dissipation	http://agoa.top/en/News/details.html?id=3632
A09	Qualcomm and Huawei: Patent Licensing Terms and Logic Folding Specs	https://finance.biggo.com/news/6520ef39-1dd1-400a-ab83-9290855da6ee
A10	Fluorine-Free Battery Binder: UC San Diego and TRI-NA Specs	https://www.tomorrowstoday.com/sustainability/sustainable-glue-offers-a-green-option-for-battery-manufacturing/

Scope: retrieving a source does not independently validate performance, cost or clinical utility. The claim ledger distinguishes announcements, papers and secondary reporting. Material published before the reporting week is continuing context, not a new event. Editorial inferences and actions are not investment or medical advice.

Adhesives_Sealants — Selected Articles

Date: 2026-10-18

Articles: 10

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- #06 Liquid Metal TIM: Gallium-Copper Bonding and Solidification Analysis
- #07 StarPower MD53HFL120L2S_B20: SiC MOSFET Module Specs
- #08 β -Ga₂O₃ MOSFETs: Diamond TSL and Si Microchannel Heat Dissipation
- #09 Qualcomm and Huawei: Patent Licensing Terms and Logic Folding Specs
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#01 Fluorine-Free Battery Binder: UC San Diego's Sustainable Specs

Published October 16, 2026 Resource Recycling USA



OVERVIEW

Researchers from the University of California San Diego and Toyota Research Institute of North America have developed a water-processable, fluorine-free battery binder. This innovation reduces energy costs by 6.9%-9.3% and lowers greenhouse gas emissions by 7.2% during recycling, enabling a more sustainable circular economy for lithium-ion batteries.

Key Findings

The developed fluorine-free binder enables the full recovery of spent positive and negative electrodes without generating fluoride residue. Lifecycle analysis indicates that this binder strategy reduces energy costs and emissions compared to fluoride-based batteries. Specifically, recycling batteries using these solvents results in 10% less energy consumption, 3% less water usage, and a 7.2% reduction in greenhouse gas emissions.

Technical Details

The binder is composed of polyacrylic acid and carboxymethyl cellulose dissolved in water and linked with citric acid. This combination provides the flexibility, strength, and adhesion required for battery electrodes. The binder is compatible with various electrode types, including silicon, nickel-rich, and lithium iron phosphate. Furthermore, the researchers noted that this binder provides better cycle stability than batteries manufactured with fluorine. For recycling, disassembled electrodes are submerged in water, which separates the coatings from metal foil sheets without leaving residue, allowing for direct recycling into new batteries.

Background & Context

Traditional battery manufacturing relies on fluorine-containing binders due to their thermal stability and ability to create uniform electrodes. However, these binders require N-methyl-pyrrolidone (NMP), a toxic solvent linked to reproductive and developmental health issues. The process of evaporating and recovering NMP in drying ovens increases energy use and manufacturing costs. Additionally, fluorine complicates recycling, as removing the residue requires high heat or harsh chemicals, creating hazardous waste.

Significance & Outlook

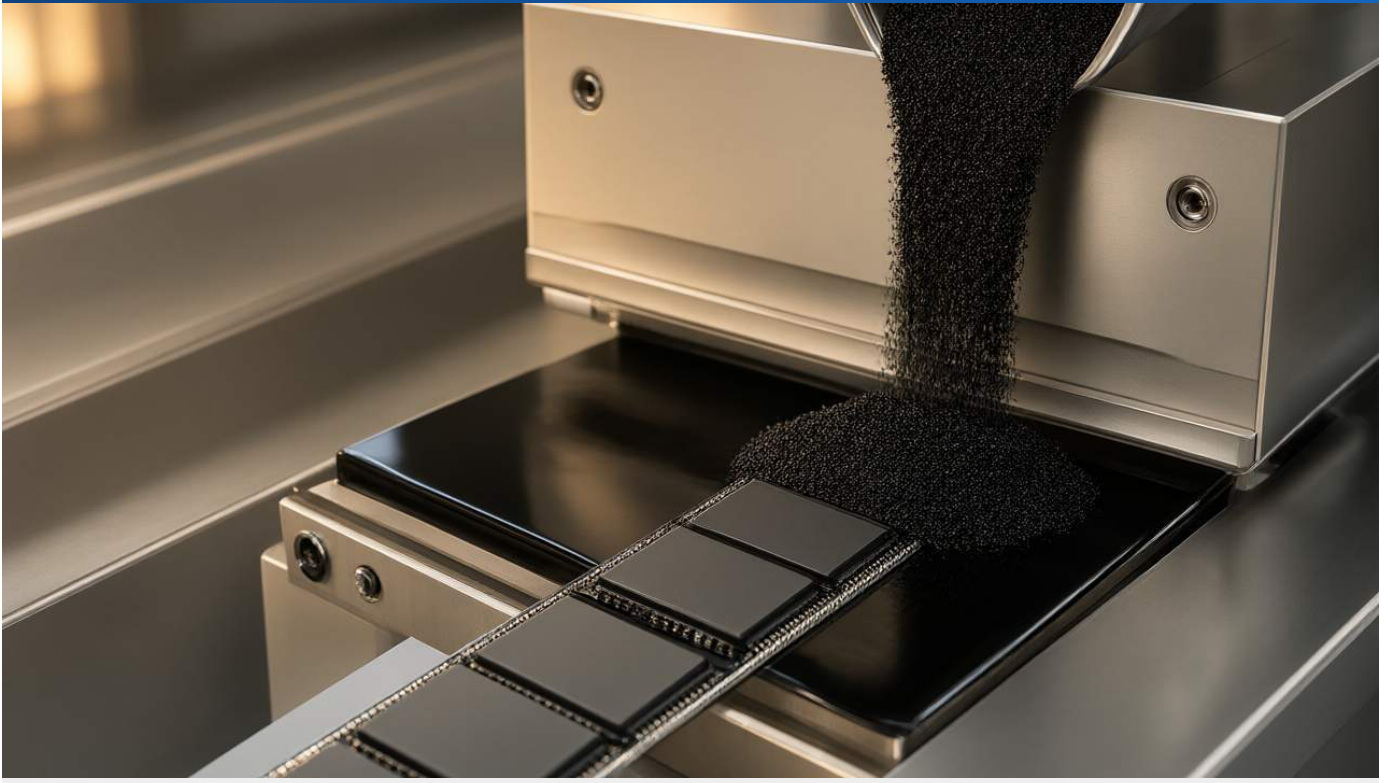
From a financial perspective, the new binder eliminates the need for expensive fluorine binders (which can cost several hundred dollars per 100 grams) and NMP solvents (\$300 per liter). Estimated profits for manufacturers could increase by 7.1%. While the researchers intend to scale production for commercial manufacturing and optimize the chemistry with industry partners, they acknowledge that manufacturers face technical, financial, and regulatory hurdles, including the need for new equipment and extensive performance verification.

Source: <https://resource-recycling.com/e-scrap/2026/10/16/researchers-work-on-fluorine-free-battery-binder/>

Collected: October 17, 2026 | Automated Research System (AI)

#02 Sumitomo Bakelite: Production Expansion for MUF and Compression Materials

Published October 09, 2026 Sumitomo Bakelite Co., Ltd. Japan



OVERVIEW

Sumitomo Bakelite is expanding production capacity for SUMIKON™ EME mold underfill (MUF) and compression-molding granules at its Suzhou, China, and Singapore sites. These investments, combined with the acquisition of Kyocera Corporation's chemical business, are designed to meet rising demand for advanced semiconductor packaging in generative AI and communications satellites.

Key Findings

Sumitomo Bakelite is increasing its global supply capabilities for advanced semiconductor encapsulation materials by installing new production lines in Suzhou, China, and Singapore. Following these expansions, the company expects its production capacity for MUF materials to approximately double and its capacity for compression-molding granules to approximately triple compared to current levels.

Technical Details

The expansion focuses on two primary product lines: SUMIKON™ EME mold underfill (MUF) materials and compression-molding granules. The implementation timeline is as follows:

- **Suzhou, China:** New production lines will be installed at the new plant completed in 2024, with production scheduled to begin in fiscal 2030.
- **Singapore:** New production lines will be installed within the existing plant, with production scheduled to begin at the end of fiscal 2028.

Technically, the MUF materials are designed for high reliability and manufacturing efficiency by filling solder joints and encapsulating the package in a single molding process, offering low-warpage characteristics and high filling performance in microscopic gaps. The compression-molding granules utilize optimized filler size, resin viscosity, and particle-size distribution to ensure uniform molding and low warpage for large panels.

Background & Context

The investment is driven by the rapid growth of advanced semiconductors used in communications satellites and generative AI, particularly in Southeast Asia and China. These applications require semiconductor packages that are increasingly large, thin, and dense, necessitating materials that can maintain structural integrity and productivity during manufacturing.

Significance & Outlook

To further strengthen its supply chain, Sumitomo Bakelite is also executing the acquisition of Kyocera Corporation's chemical business at the end of October, which will add further capacity for both MUF and compression-molding granules. These combined initiatives aim to secure a robust global supply system across Japan, China, and Southeast Asia to capture growing market share in the advanced semiconductor sector.

Source: https://www.sumibe.co.jp/english/topics/2026/it-materials/1007_01/index.html

Collected: October 17, 2026 | Automated Research System (AI)

#03 Henkel BONDERITE: Productivity Gains in Aluminium Anodising

Published October 12, 2026 Henkel Adhesive Technologies Germany



OVERVIEW

Henkel has introduced a suite of BONDERITE technologies for aluminium anodising that optimize degreasing, etching, and sealing processes. Key advancements include a nickel-free cold sealing additive and a hot sealing additive that increases productivity by at least 20 percent. These innovations aim to reduce toxicity and CO2 footprints while enhancing the aesthetic and protective qualities of lightweight aluminium parts.

Key Findings

Henkel's latest BONDERITE portfolio focuses on increasing productivity and sustainability across the electrochemical aluminium anodising process. The most significant performance gains are found in the sealing stage, where the BONDERITE M ED 11011 hot sealing additive increases productivity by a minimum of 20 percent and can at least double the standard life span of sealed parts.

Technical Details

The product line addresses three critical stages of the anodising process:

- **Degreasing:** BONDERITE C AK 62115 is a one-component, non-etching degreaser designed for high-gloss aesthetic parts that cannot be etched. It simplifies handling compared to two-component alternatives and removes residual brushing paste.
- **Etching:** BONDERITE C AK 62250 is a long-life etching additive tailored for E6 finishes (a thorough etching process used to eliminate larger surface defects). It is designed for bath stability, reduced drag-out, and no foaming.
- **Sealing:**
 - BONDERITE M ED 11011 (Hot Sealing): Sets a standard sealing time of 3 min/μm and reduces bath make-up by 50 percent or more, lowering the CO2 footprint.
 - BONDERITE M ED 11150/11151 (Cold Sealing): These QUALANOD approved additives are completely nickel-free, removing traditional toxicity issues without compromising sealing quality or process time.

Background & Context

Aluminium naturally forms an uncontrolled, unaesthetic oxide layer when exposed to oxygen and weathering. While galvanic coating prevents this, it adds weight. Anodising converts the outermost layer into a controlled, smooth oxide skin typically between 5 and 25 μm thick, protecting the surface from further corrosion without adding significant mass.

Significance & Outlook

These innovations address the growing industrial demand for lightweight, aesthetic aluminium components. By reducing chemical consumption and eliminating toxic substances like nickel, Henkel aims to provide a more sustainable and cost-effective alternative to traditional anodising methods, particularly for manufacturers seeking to maximize process efficiency and reduce environmental impact.

Source: <https://next.henkel-adhesives.com/hr/en/articles/higher-productivity-ease-of-handling-and-no-nickel.html>

Collected: October 17, 2026 | Automated Research System (AI)

#04 BONDERITE M-NT 41040: Zirconium-Based Coating Specs and Benefits

Published October 12, 2026 Henkel Adhesive Germany



OVERVIEW

Henkel has developed a next-generation zirconium-based, phosphate-free cleaner-coater, BONDERITE M-NT 41040, to replace traditional iron phosphate technologies. The solution enables room-temperature application to reduce energy consumption and emissions while improving paint adhesion and corrosion protection. This shift toward nano-technology-based coatings allows metal manufacturers to enhance productivity by reducing sludge and processing times.

Key Findings

The primary advancement in Henkel's next-generation cleaner-coater portfolio is the transition from iron phosphate-based chemistry to zirconium-based, phosphate-free technology. Specifically, BONDERITE M-NT 41040 eliminates the need for heavy metals and high-temperature baths, resulting in a manufacturing process that reduces energy costs, emissions, and waste generation.

Technical Details

BONDERITE M-NT 41040 is a surface treatment liquid designed for spray application on various substrates, including iron, aluminium, zinc, and mixed-metal alloys. Unlike traditional cleaner-coaters that require bath temperatures of approximately 60 degrees Celsius, this zirconium-based solution can be applied at room temperature.

The coating utilizes nano technology to achieve several technical improvements over previous generations:

- **Physical Properties:** Creates hard-wearing, flexible, and long-lasting finishes with low weight.
- **Performance:** Provides superior paint adhesion and enhanced protective performance against corrosion compared to iron phosphate solutions.
- **Process Efficiency:** Reduces the volume of sludge and enables shorter processing cycles to increase overall productivity.

Background and Context

Conventional cleaner-coaters based on iron phosphate present significant environmental and operational challenges. These include high energy requirements for heating baths and the generation of phosphorous-containing wastewater and sludge, which require time-consuming management. Furthermore, these older technologies offer limited corrosion protection and paint adhesion for metal surfaces.

Significance and Outlook

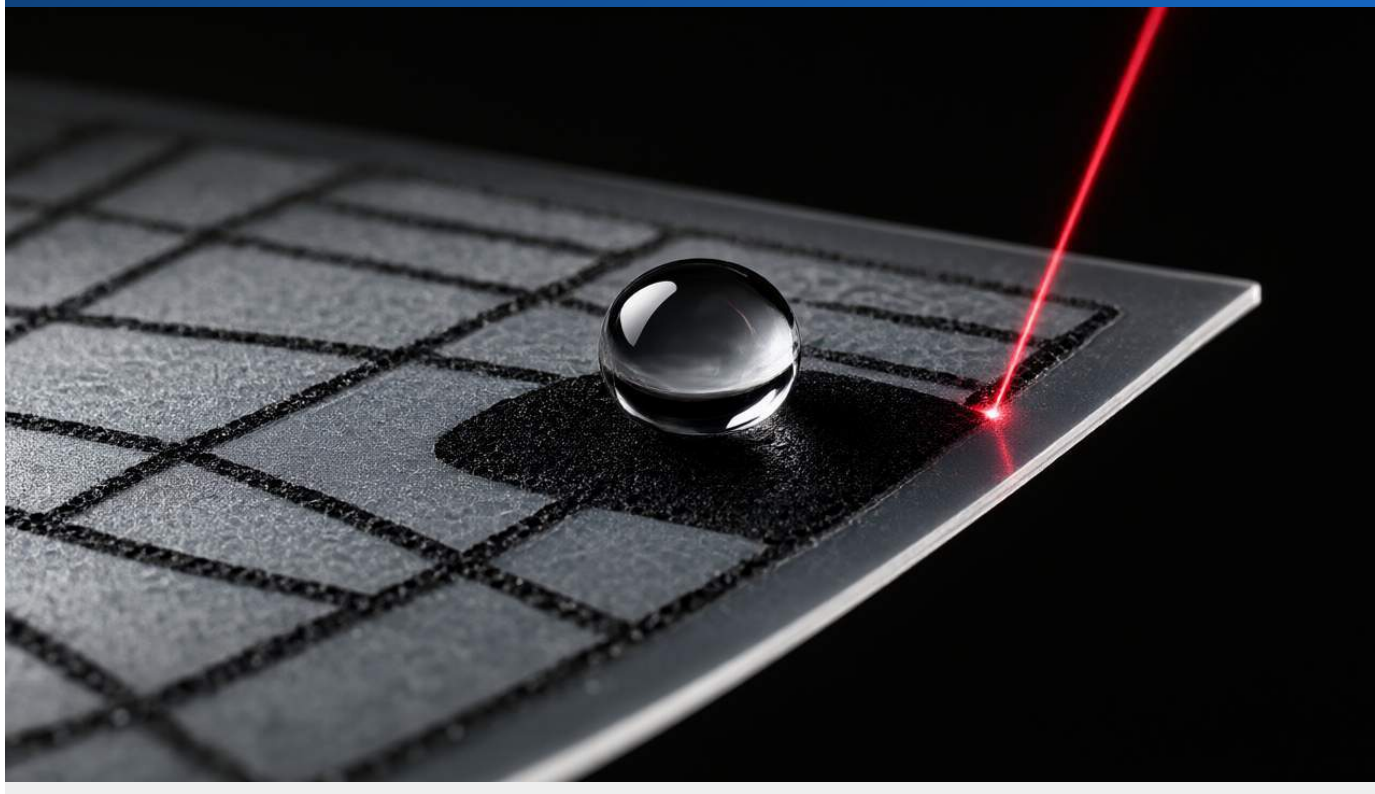
The adoption of zirconium-based coatings allows the metals industry to align performance gains with sustainability goals. By removing phosphorous and heavy metals from the process, companies can reduce their environmental footprint while improving the quality of the end product. This technology is currently utilized by various global metals industry partners, including Rudolph Bros. & Co., Clark Pulley, Jonkman Coating, Prince Manufacturing, Reading Truck, and BSH.

Source: <https://next.henkel-adhesives.com/sk/en/articles/new-generation-coatings.html>

Collected: October 17, 2026 | Automated Research System (AI)

#05 Laser-Pyrolyzed PDMS: Monolithic Antifouling Bioelectronics Specs

Published October 12, 2026 OAE Publishing China



OVERVIEW

Researchers have developed a one-step direct laser writing strategy to transform pristine PDMS into a superhydrophobic silicon oxycarbide (SiOC)/graphenic composite. This monolithic platform achieves a 94.47% reduction in *E. coli* attachment while enabling rapid interfacial charge transfer via localized electrowetting. The technology eliminates the need for multi-material integration in self-cleaning electrochemical biosensors.

Key Findings

The study introduces a monolithic material transformation that converts polydimethylsiloxane (PDMS) into a hierarchical SiOC/graphenic composite. This platform achieves a water contact angle of 157° and a sliding angle of approximately 3° . Under high-load conditions of 10^8 CFU/mL, the material demonstrated a 94.47% reduction in Escherichia coli (E. coli) attachment. Despite this superhydrophobicity, the interface allows for rapid interfacial charge transfer ($k_0 = 0.00708$ cm/s) under applied electrochemical potentials, enabling the fabrication of a bacterial-imprinted polymer (BIP) biosensor with a limit of detection of 348 CFU/mL.

Technical Details

The process utilizes a one-step, ambient-air direct laser writing (DLW) strategy. Repeated laser passes are employed to facilitate thermal relaxation and build the hierarchical roughness required for both superhydrophobicity and an enhanced electroactive surface area. The resulting architecture creates a thermodynamic barrier to biofouling guided by the Young-Dupré equation. While the macroscopic surface remains antifouling, applied potentials trigger localized electrowetting within the hierarchical domains, overcoming the typical Faradaic charge transfer barriers associated with superhydrophobic silica films.

Background & Context

PDMS is widely used in flexible microdevices due to its biocompatibility and transparency, but it is typically insulating and prone to biofouling. Previous attempts to add conductivity or antifouling properties relied on heterogeneous solutions, such as:

- Surface-grafted hydrophilic polymers or conductive inks, which often suffer from delamination.
- Metallic biocides, which can lead to leaching and cytotoxicity.
- Bulk carbon doping, which can embrittle the elastomer.
- Transferring laser-induced graphene (LIG) from polyimide substrates, which increases procedural complexity.

Significance & Outlook

This approach resolves the long-standing dichotomy between antifouling properties and electrical conductivity in PDMS. By eliminating the need for external carbon precursors or complex multi-material integration, the monolithic SiOC/graphenic composite provides a feasible paradigm for durable, self-cleaning bioelectronics and in-situ microbial monitoring.

Source: <https://www.oaepublish.com/articles/ss.2026.178>

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#06 Liquid Metal TIM: Gallium-Copper Bonding and Solidification Analysis

Published October 16, 2026 Tom's Hardware USA



OVERVIEW

Electron microscope testing reveals that liquid metal thermal interface materials (TIM) do not dry out but instead react chemically with copper to form a solid compound. While nickel plating reduces the thickness of this layer by approximately 10 times, the process highlights critical material compatibility and supply chain risks for high-power density components.

Key Findings

Research conducted by der8auer using an electron microscope demonstrates that gallium-based liquid metal TIM does not evaporate or dry out over time. Instead, it reacts with copper coolers to form a solid compound, CuGa₂. In tests, the TIM appeared liquid after one hour, showed crystals at two months, and remained unchanged after two years. This reaction creates a solid film that cannot be remelted, as CuGa₂ remains solid up to approximately 254 degrees Celsius.

Technical Details

The chemical reaction varies significantly based on the cooler material:

- **Copper:** Gallium bonds with copper to form CuGa₂ (one copper atom to two gallium atoms). This layer grows about 1 micrometer per day, eventually reaching 50 to 100 micrometers. The heat conductivity of CuGa₂ is approximately 100 W/mK, compared to roughly 400 W/mK for bare copper.
- **Nickel Plating:** Gallium forms NiGa₅ (one nickel atom to five gallium atoms). This layer is significantly thinner—between 1 and 10 micrometers—making nickel plating generally superior as it protects the underlying copper and absorbs less gallium.
- **Aluminum:** Gallium penetrates grain boundaries once the oxide layer is broken, causing surface swelling within five minutes and making the metal brittle within half an hour.

Background and Context

The TIM used is a gallium-indium-tin alloy that remains liquid at room temperature (melting at 11 degrees Celsius). The need for advanced cooling is driven by rising power densities in hardware such as the RTX 5090 and RTX 5080, which der8auer states have "twice" and "three times" the power density of the 8800 GTX, respectively.

Significance and Outlook

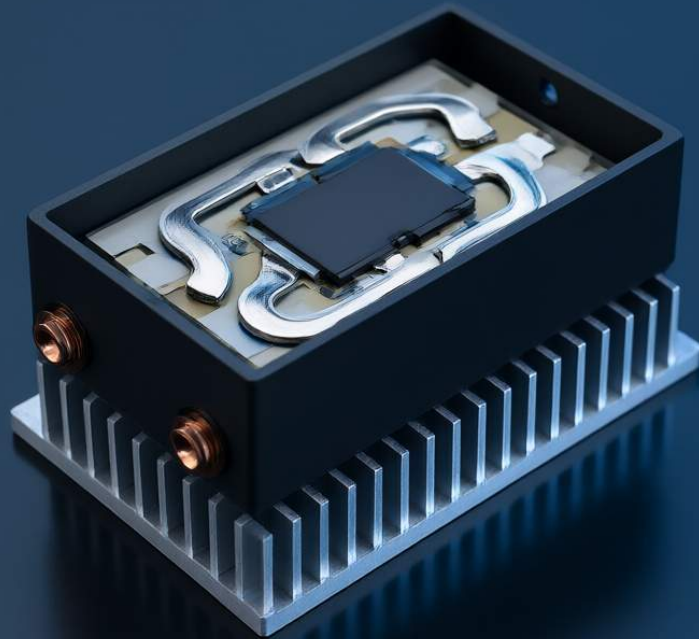
Due to the risks of hardware destruction and the complexity of residue removal, this TIM is recommended only for enthusiasts and high-power density components. Thermal Grizzly is exploring new coatings to replace nickel by next year and is developing a KryoSheet graphene pad for bare dies. Additionally, gallium costs have risen sharply, increasing from €300 per kilogram five years ago to €2,500–3,000 currently, influenced by China's export license requirements.

Source: <https://www.tomshardware.com/pc-components/cooling/experiment-shows-liquid-metal-tim-doesnt-dry-out-it-turns-solid-two-year-electron-microscope-test-finds-gallium-bonds-with-copper-coolers-and-nickel-plating-keeps-the-layer-about-10-times-thinner>

Collected: October 17, 2026 | Automated Research System (AI)

#07 StarPower MD53HFL120L2S_B20: SiC MOSFET Module Specs

Published October 16, 2026 Electronics For You India



OVERVIEW

StarPower Semiconductor has developed the MD53HFL120L2S_B20, a 1200 V, 120 A SiC MOSFET power module featuring a half-bridge topology. The module reduces conduction and switching losses to increase power density and lower cooling requirements in automotive and industrial applications.

Key Findings

The MD53HFL120L2S_B20 is a silicon carbide (SiC) metal-oxide-semiconductor field-effect transistor (MOSFET) power module designed for high-efficiency power conversion. It integrates two dual N-channel SiC MOSFETs in a series-connected half-bridge circuit, targeting applications that require high power density within space-constrained designs.

Technical Details

The module is rated for 1200 V and 120 A, featuring a drain-source on-resistance ($R_{DS(on)}$) of 5.3 m Ω at 25°C. To enhance thermal management and performance, the device utilizes aluminium nitride-active metal brazed (AlN-AMB) substrate technology and a direct-bonded copper (DBC) substrate for efficient cooling. Key technical specifications include:

- Operating temperatures up to 150°C.
- Optimized freewheeling diode to minimize conduction losses.
- Low-inductance design compatible with printed circuit board (PCB) mounting.
- Availability in standard-pin and press-fit-pin configurations.

Background & Context

The module is engineered for compatibility with existing silicon insulated-gate bipolar transistor (Si-IGBT) layouts. This design choice allows manufacturers to migrate to SiC-based power electronics and upgrade power-conversion stages without requiring a complete redesign of the system architecture. It is specifically optimized for mid-range and cost-sensitive industrial applications.

Significance & Outlook

By reducing energy losses and heatsink requirements, the MD53HFL120L2S_B20 enables more compact power-electronics assemblies. Its application range spans several high-voltage sectors:

- **Electric Mobility:** Main and auxiliary EV drives and onboard chargers.

- **Energy Infrastructure:** Central and string solar inverters, and uninterruptible power supply (UPS) systems.
- **Industrial Automation:** DC servo systems, robotic drives, and high-efficiency switched-mode power supplies (SMPS).

Source: <https://www.electronicsforu.com/news/sic-power-module-improves-high-voltage-efficiency>

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#08 β -Ga₂O₃ MOSFETs: Diamond TSL and Si Microchannel Heat Dissipation

Published October 08, 2026 agoa.top China



OVERVIEW

Researchers have developed a hybrid thermal management strategy combining a diamond thermal spreading layer (TSL) with substrate-embedded silicon microchannels to mitigate self-heating in β -Ga₂O₃ MOSFETs. This approach reduces peak device temperature by approximately 55.6 K, achieving performance within 5 K of high-cost diamond microchannel solutions.

Key Findings

The proposed hybrid thermal management strategy significantly enhances heat dissipation in $\beta\text{-Ga}_2\text{O}_3$ MOSFETs by integrating a 5 μm thick diamond thermal spreading layer (TSL) with silicon-substrate-embedded microchannels. This configuration reduces the peak device temperature by approximately 55.6 K. When compared to state-of-the-art substrate-embedded diamond microchannel strategies, the performance gap is only 5 K, offering a more cost-effective and manufacturable alternative.

Technical Details

The research utilized a cross-platform electro-thermal coupling modeling method, extracting equivalent heat sources via Sentaurus TCAD simulations and performing 3D thermal simulations in COMSOL. The study identified that the primary thermal bottleneck in [010]-oriented $\beta\text{-Ga}_2\text{O}_3$ MOSFETs is suppressed lateral heat spreading due to low in-plane thermal conductivity.

- **Heat Spreading:** The diamond TSL increased the heat spreading angle from 32.2° to 88° , expanding the effective heat transfer area by approximately 80 times.
- **Interfacial Resistance:** Due to the efficiency of the lateral spreading, the effect of the diamond/substrate interfacial thermal resistance on junction temperature was found to be negligible.
- **Optimization:** The study systematically analyzed variables including TSL thickness, interfacial thermal resistance, microchannel position, flow velocity, and external thermal resistance.

Background & Context

$\beta\text{-Ga}_2\text{O}_3$ is a candidate for next-generation high-voltage power electronics due to its bandgap of approximately 4.8 eV and a critical breakdown field strength of up to 8 MV/cm. However, it suffers from low and anisotropic thermal conductivity (approximately $27.1 \text{ W m}^{-1} \text{ K}^{-1}$ along the [010] direction and $10.7 \text{ W m}^{-1} \text{ K}^{-1}$ along the [100] direction), which causes severe localized self-heating and limits device reliability.

Significance & Outlook

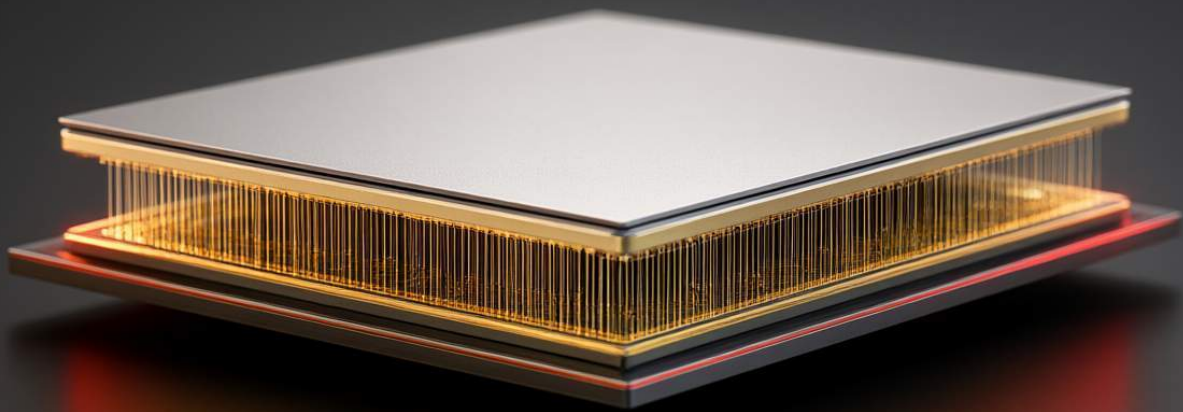
By overcoming the lateral heat dissipation bottleneck, this hybrid strategy balances high thermal performance with manufacturing feasibility. It provides a theoretical and engineering-valuable solution for the thermal design of high-power $\beta\text{-Ga}_2\text{O}_3$ devices, reducing the reliance on prohibitively expensive full-diamond microchannel substrates.

Source: <http://agoa.top/en/News/details.html?id=3632>

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#09 Qualcomm and Huawei: Patent Licensing Terms and Logic Folding Specs

Published October 08, 2026 BigGo Finance Taiwan



OVERVIEW

Qualcomm has denied reports that it is a net payer to Huawei or that their new multi-year patent licensing agreement includes "Logic Folding" chip technology. The agreement covers cross-licensing in 5G, AI, and computing, alongside Qualcomm's acquisition of certain non-cellular US patents from Huawei. This dispute highlights the technical significance of Huawei's 3D stacking approach used in the Kirin 9050 Pro.

Key Findings

Qualcomm and Huawei entered a multi-year, broad patent licensing agreement on October 5, covering 5G, computing, artificial intelligence, and networking. While Qualcomm is acquiring specific non-cellular US patents from Huawei, the company explicitly refuted claims that it has become a net payer to Huawei. Furthermore, Qualcomm denied that the agreement involves licenses for Huawei's "Logic Folding" chip technology, contradicting earlier reports from Bloomberg and Shenzhen TV's "Shenzhen News."

Technical Details of Logic Folding

Logic Folding is a technology path within Huawei's "Tau Scaling Law" framework, introduced by He Tingbo at the IEEE ISCAS 2026 conference. The approach aims to circumvent EUV lithography restrictions by compressing signal delay through vertical stacking rather than transistor shrinking. Key technical specifications include:

- **Architecture:** Two bonded active dies working as a single unit using copper-to-copper hybrid bonding.
- **Interconnects:** A 1.5-micron hybrid bonding pitch with approximately 50 million interconnect points.
- **Performance Gains:** Wire length is reduced by 30%, core routing by 20%, and critical paths by up to 70%.
- **Efficiency:** At equivalent performance, power consumption is reduced by 66% for the NPU, 58% for the GPU, and 41% for CPU performance cores.

Implementation in Kirin 9050 Pro

The technology is implemented in the Kirin 9050 Pro chip found in the Mate XT 2 tri-fold phone. Die-level teardowns reveal a face-to-face bonded structure where the upper die contains high-density compute units (CPU execution units, GPU, NPU logic), while the lower die houses the L3 cache, 12MiB system cache, PLL, and I/O interfaces (LPDDR, PCIe, USB). The combined die area exceeds 240 square millimeters, with transistor density increasing to 238 MTr/mm² from 155 MTr/mm².

Significance and Outlook

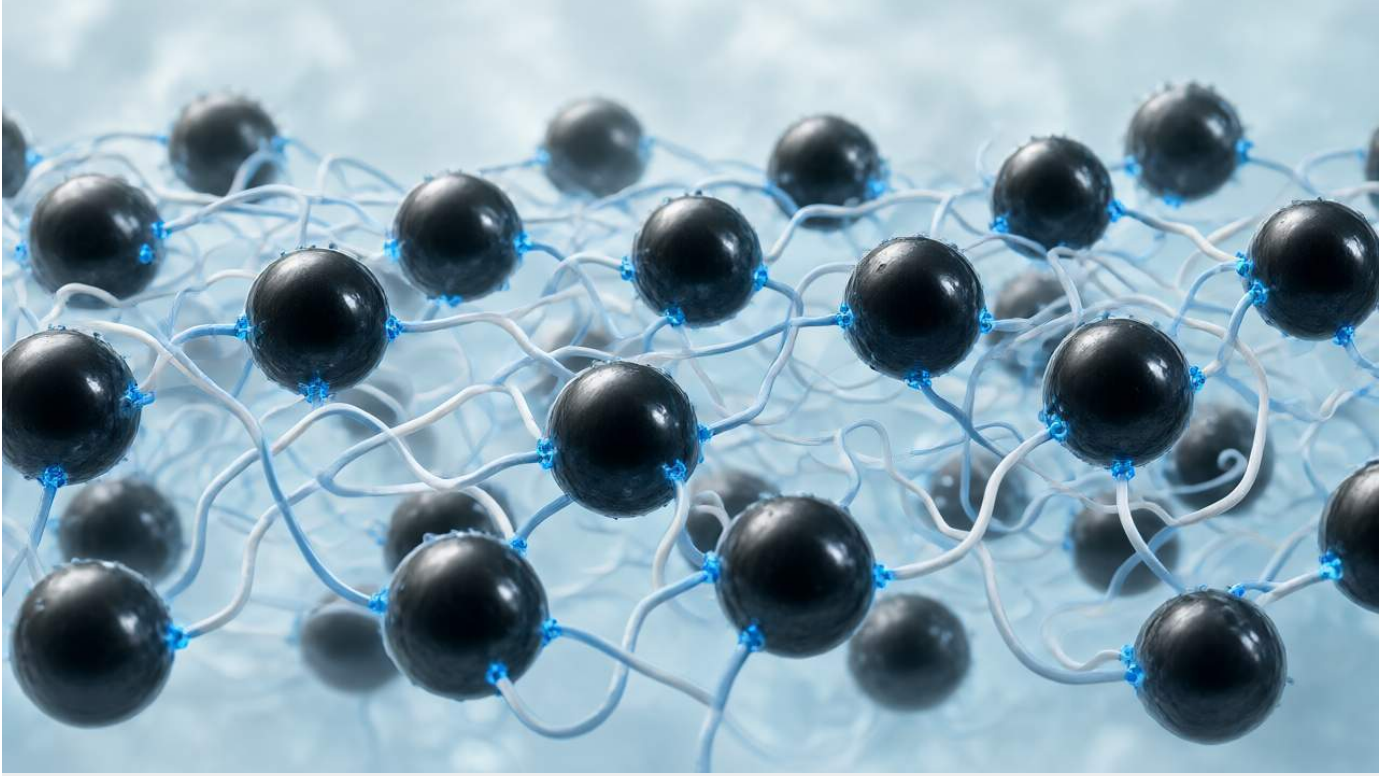
The controversy over the licensing terms underscores the industry's interest in Huawei's ability to maintain performance via 3D stacking. While the official agreement remains confidential, the denial of "Logic Folding" licenses suggests that this specific architectural path remains proprietary to Huawei.

Source: <https://finance.biggo.com/news/6520ef39-1dd1-400a-ab83-9290855da6ee>

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#10 Fluorine-Free Battery Binder: UC San Diego and TRI-NA Specs

Published October 12, 2026 Innovation Sustainability USA



OVERVIEW

Researchers from UC San Diego and the Toyota Research Institute of North America have developed a water-soluble, fluorine-free binder for lithium-ion batteries. By utilizing a mix of affordable polymers and citric acid, the team has created a sustainable alternative that maintains performance while simplifying the recycling process.

Key Findings

Engineers from the University of California, San Diego, and the Toyota Research Institute of North America have developed a fluorine-free binder that dissolves in water. This new binder maintains stability through thousands of charge cycles and is compatible with various battery types, including silicon and graphite anodes.

Technical Details

The binder is composed of a mixture of two affordable polymers: polyacrylic acid and carboxymethyl cellulose. To connect these polymers, the researchers utilized citric acid. Unlike conventional binders, this formulation is water-soluble, allowing the binder to dissolve when battery parts are soaked in water. This process enables the electrode material to separate from the metal foil without leaving chemical residues.

Background & Context

Most current lithium-ion battery binders contain fluorine, which necessitates the use of toxic solvents during the manufacturing process. According to Jiao Lin, a postdoctoral researcher in Professor Zheng Chen's lab, traditional production requires large drying ovens to remove these solvents, which increases energy consumption, costs, and environmental impact. Furthermore, Professor Zheng Chen notes that the stability of conventional fluorine binders makes the resulting batteries significantly harder to recycle, producing hazardous waste.

Significance & Outlook

The new design eliminates the need for energy-intensive drying ovens and toxic solvents, reducing the overall environmental footprint of battery manufacturing. Testing indicates that materials recovered via the water-dissolution method can be used to create new batteries that perform as well as those made with traditional components. The research team, whose findings appear in *Nature Communications*, now plans to adjust the formula for various industry battery types and scale up production for commercial application.

Source: <https://www.tomorrowstoday.com/sustainability/sustainable-glue-offers-a-green-option-for-battery-manufacturing/>

Collected: October 17, 2026 | Automated Research System (AI)