TROY TECHNICAL

ADHESIVES & SEALANTS
WEEKLY REPORT

October 31 - November 6, 2026 | Issue 2026-W44

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

10	10
ANALYZED ARTICLES	PRIORITY THEMES

Issued 2026-11-06 | 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 | CHEMISTRY

Polyolefin Upcycling: ETH Zurich's Process for High-Value Adhesives

Researchers at ETH Zurich have developed a single-step process to upcycle polyethylene (PE) and polypropylene (PP) waste into high-performance adhesives.

SIGNAL 02 | FORMULATION

Indium-Based Thermal Bonding: IMC Growth Kinetics and Analysis

Research on indium thermal interface material (TIM) bonding with Au/Ni-plated copper reveals the distinct evolution of AuIn 2 and (Ni,Au) 3 In 7 intermetallic compounds.

SIGNAL 03 | APPLICATION & CURE

Changan Auto: Vision AI Gluing Robot and 8% Efficiency Gain

Changan Automobile has deployed its first vision AI adhesive application robot at the Liangjiang Plant to optimize the PVC undercoat gluing process.

SIGNAL 04 | QUALIFIED PRODUCT

MacDermid Alpha BondPad: SiC Die-Topside Sintering Specs for 2026

MacDermid Alpha is introducing BondPad, a copper-foil solution using Argomax sinter film for high-reliability SiC package die-topside attach.

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

8%
A09

SOURCE-BOUND CONDITION
The system utilizes deep Convolutional Neural Networks (CNN) to increase hourly output (JPH) by approximately 8% while achieving risk detection accuracy exceeding 99.5%.

99.999%
A04

SOURCE-BOUND CONDITION
The film achieves over 99.999% electromagnetic interference (EMI) shielding and maintains 95% performance after 10,000 bending cycles.

24 times
A03

SOURCE-BOUND CONDITION
The LM-EIM exhibits stretch tolerance 24 times higher than solder and 35 times higher than conductive adhesives, allowing for the integration of high-performance components into multifunctional stretchable electronics.

100%
A08

SOURCE-BOUND CONDITION
The material is 100% reactive, non-cytotoxic per ISO 10993-5, and resistant to repeated sterilization.

P05
A07

SOURCE-BOUND CONDITION
Researchers have developed PGa III, a thermoresponsive Janus-adhesive hydrogel that seals gastrointestinal fistulas via a minimally invasive endoscopic procedure.

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

Researchers at ETH Zurich have developed a single-step process to upcycle polyethylene (PE) and polypropylene (PP) waste into.

2

Formulation

P02/P07

Research on indium thermal interface material (TIM) bonding with Au/Ni-plated copper reveals the distinct evolution of AuIn 2.

3

Application & cure

P03/P08

Changan Automobile has deployed its first vision AI adhesive application robot at the Liangjiang Plant to optimize the PVC.

4

Qualified product

P04/P09

MacDermid Alpha is introducing BondPad, a copper-foil solution using Argomax sinter film for high-reliability SiC package.

5

Repair & circularity

P05/P10

Researchers have developed PGa III, a thermoresponsive Janus-adhesive hydrogel that seals gastrointestinal fistulas via a.

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



P01	Polyolefin Upcycling: ETH Zurich's Process for High-Value Adhesives Tech / process | cue: no system/business cue
P02	Indium-Based Thermal Bonding: IMC Growth Kinetics and Analysis Tech / process | cue: no system/business cue
P03	Changan Auto: Vision AI Gluing Robot and 8% Efficiency Gain System / adoption | cue: deployed
P04	MacDermid Alpha BondPad: SiC Die-Topside Sintering Specs for 2026 Business / rules | cue: infrastructure
P05	PGa III Hydrogel: Slug-Inspired Endoscopic Fistula Repair Specs Tech / process | cue: no system/business cue
P06	Aramid Nanofiber Films: High-Performance Heat Dissipation and EMI Shielding Specs Tech / process | cue: no system/business cue
P07	Bio-inspired Leather: Bacterial Cellulose and Soybean Oil Specs Tech / process | cue: no system/business cue
P08	Liquid Metal Interfaces: Mounting Rigid Components on Kirigami Substrates System / adoption | cue: integration
P09	ETH Zurich Plastic Adhesive: Upcycling Polyolefins for High-Strength Bonding Tech / process | cue: no system/business cue
P10	Supreme 17HTMed: Medical Grade Epoxy Specs and Thermal Limits Business / rules | cue: ISO

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 Polyolefin Upcycling: ETH Zurich's Process for High-Value Adhesives

A06 | Chemistry | Joint evaluation

2026-11-05

FACT

Researchers at ETH Zurich have developed a single-step process to upcycle polyethylene (PE) and polypropylene (PP) waste into high-performance adhesives. The method grafts additional polymer chains onto plastic waste using chlorinated solvents and light, enabling the creation of materials suitable for industrial load-bearing joints.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P01.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

EDITORIAL SCORE 20/25 | MATURITY 3/5 | DECISION LOCUS: TECH / PROCESS

P02 Indium-Based Thermal Bonding: IMC Growth Kinetics and Analysis

A01 | Formulation | Research

2026-11-06

FACT

Research on indium thermal interface material (TIM) bonding with Au/Ni-plated copper reveals the distinct evolution of AuIn 2 and (Ni,Au) 3 In 7 intermetallic compounds. The study identifies an apparent activation energy of 77.45 kJ/mol for the (Ni,Au) 3 In 7 layer, demonstrating that single-step global fitting provides higher stability against thickness variation than conventional methods.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P02.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

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

P03 Changan Auto: Vision AI Gluing Robot and 8% Efficiency Gain

A09 | Application & cure | Scale-up

2026-11-06

FACT

Changan Automobile has deployed its first vision AI adhesive application robot at the Liangjiang Plant to optimize the PVC undercoat gluing process. The system utilizes deep Convolutional Neural Networks (CNN) to increase hourly output (JPH) by approximately 8% while achieving risk detection accuracy exceeding 99.5%.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P03.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

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

P04 MacDermid Alpha BondPad: SiC Die-Topside Sintering Specs for 2026

A05 | Qualified product | Research

2026-11-04

FACT

MacDermid Alpha is introducing BondPad, a copper-foil solution using Argomax sinter film for high-reliability SiC package die-topside attach. The technology demonstrates a 30-fold increase in lifespan over conventional aluminium wirebonding under specific power-cycling tests. This approach enables manufacturers to transition to sintered interconnects while utilizing existing wire-bonding infrastructure.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P04.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: BUSINESS / RULES

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

P05 PGa III Hydrogel: Slug-Inspired Endoscopic Fistula Repair Specs

A07 | Repair & circularity | Pilot

2026-11-05

FACT

Researchers have developed PGa III, a thermoresponsive Janus-adhesive hydrogel that seals gastrointestinal fistulas via a minimally invasive endoscopic procedure. In animal models, the sealant demonstrated superior recovery rates and lower mortality compared to sutures and fibrin glue, offering a potential alternative to stents and titanium clips.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P05.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P06 Aramid Nanofiber Films: High-Performance Heat Dissipation and EMI Shielding Specs

A04 | Chemistry | Pilot

2026-11-03

FACT

Researchers at Korea National University of Transportation have developed an ultra-thin composite film using decomposed and recombined Kevlar fibers. The film achieves over 99.999% electromagnetic interference (EMI) shielding and maintains 95% performance after 10,000 bending cycles.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P06.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

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

P07 Bio-inspired Leather: Bacterial Cellulose and Soybean Oil Specs

A02 | Formulation | Pilot

2026-11-04

FACT

Researchers in China have developed a flexible bio-inspired leather composite using bacterial cellulose, collagen, and a bio-based adhesive made from epoxidized soybean oil and citric acid. The material achieves a tensile strength of 57.3 megapascals and significantly improves water resistance and flexibility compared to untreated bacterial cellulose. This composite offers a renewable alternative to natural leather with mechanical properties that overlap with typical leather ranges.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P07.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P08 Liquid Metal Interfaces: Mounting Rigid Components on Kirigami Substrates

A03 | Application & cure | Pilot

2026-10-30

FACT

Researchers have developed a liquid metal electrical interface material (LM-EIM) that enables the mounting of rigid electronic components on kirigami stretchable substrates without reducing stretch tolerance. The LM-EIM exhibits stretch tolerance 24 times higher than solder and 35 times higher than conductive adhesives, allowing for the integration of high-performance components into multifunctional stretchable electronics.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P08.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

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

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

P09 ETH Zurich Plastic Adhesive: Upcycling Polyolefins for High-Strength Bonding

A10 | Qualified product | Pilot

2026-11-06

FACT

Researchers at ETH Zurich have developed a method to transform waste polyethylene and polypropylene into a high-performance adhesive capable of lifting 20 kilograms with just 13 milligrams of material. By using light-induced chemical modification to add polar polymer side chains, the team has converted non-polar plastic waste into a technical material that bonds strongly to metal, glass, and wood.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P10 Supreme 17HTMed: Medical Grade Epoxy Specs and Thermal Limits

A08 | Repair & circularity | Pilot

2026-10-30

FACT

Master Bond has developed Supreme 17HTMed, a one-component toughened epoxy for medical device bonding and sealing that withstands temperatures up to 550°F. The material is 100% reactive, non-cytotoxic per ISO 10993-5, and resistant to repeated sterilization. This combination of thermal stability and biocompatibility enables its use in demanding medical environments requiring aggressive chemical or autoclave sterilization.

WHY IT MATTERS

The decision relevance is bond-line performance, cure process, durability and cross-industry qualification. 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, provide substrate preparation, cure window, rework, aging and failure-analysis evidence.

ACTION

Within 30 days, evaluate the complete joint or sealed system under process and lifetime conditions; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: adhesion aging, cure variability, outgassing, regulation, repair and scale.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: BUSINESS / RULES

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	Indium-Based Thermal Bonding: IMC Growth Kinetics and Analysis	https://www.jstage.jst.go.jp/article/matertrans/advpub/0/advpub_MT-M2026110/_article
A02	Bio-inspired Leather: Bacterial Cellulose and Soybean Oil Specs	https://bioengineer.org/bacterial-cellulose-and-soybean-oil-adhesive-yield-flexible-bio-inspired-leather/
A03	Liquid Metal Interfaces: Mounting Rigid Components on Kirigami Substrates	https://doi.org/10.1038/s41528-026-00662-1
A04	Aramid Nanofiber Films: High-Performance Heat Dissipation and EMI Shielding Specs	https://www.gukjenews.com/news/articleView.html?idxno=3740665
A05	MacDermid Alpha BondPad: SiC Die-Topside Sintering Specs for 2026	https://compoundsemiconductor.net/article/125787/MacDermid_Alpha_to_show_new_SiC_module_tech_at_electronica
A06	Polyolefin Upcycling: ETH Zurich's Process for High-Value Adhesives	https://ethz.ch/en/news-and-events/eth-news/news/2026/11/how-plastic-waste-transforms-into-higher-value-products.html
A07	PGa III Hydrogel: Slug-Inspired Endoscopic Fistula Repair Specs	https://english.cas.cn/newsroom/research-news/202611/t20261104_1213187.shtml
A08	Supreme 17HTMed: Medical Grade Epoxy Specs and Thermal Limits	https://www.masterbond.com/newsrelease/supreme-17htmed
A09	Changan Auto: Vision AI Gluing Robot and 8% Efficiency Gain	https://autonews.gasgoo.com/articles/news/changan-auto-deploys-first-vision-ai-adhesive-application-robot-boosting-line-efficiency-by-8-2118544469233922049
A10	ETH Zurich Plastic Adhesive: Upcycling Polyolefins for High-Strength Bonding	https://www.forschung-und-wissen.de/nachrichten/chemie/13-milligramm-plastik-kleber-heben-20-kilogramm-gewicht-133715537

Adhesives_Sealants — Selected Articles

Date: 2026-11-08

Articles: 10

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#01 Indium-Based Thermal Bonding: IMC Growth Kinetics and Analysis

Published November 06, 2026 Materials Transactions（J-STAGE） Japan



OVERVIEW

Research on indium thermal interface material (TIM) bonding with Au/Ni-plated copper reveals the distinct evolution of AuIn 2 and (Ni,Au) 3 In 7 intermetallic compounds. The study identifies an apparent activation energy of 77.45 kJ/mol for the (Ni,Au) 3 In 7 layer, demonstrating that single-step global fitting provides higher stability against thickness variation than conventional methods.

IN DEPTH

Key Findings

The investigation into indium-based thermal interface bonding identifies two primary intermetallic compounds (IMCs) at the interface: AuIn 2 and (Ni,Au) 3 In 7. The study finds that the evolution of these compounds is temperature-dependent. While AuIn 2 grain area increases with reflow time at lower temperatures, higher temperatures and longer durations lead to a reduction in AuIn 2 and the growth of a continuous (Ni,Au) 3 In 7 layer.

Technical Details

Interfacial reactions were analyzed during reflow processes at 165 °C, 185 °C, and 205 °C. To determine the growth kinetics of the (Ni,Au) 3 In 7 layer, researchers employed a parabolic growth model. By applying a single-step global fitting approach across all temperature and time conditions, the following kinetic parameters were established:

- Apparent activation energy: 77.45 kJ/mol (0.80 eV)
- Pre-exponential factor: 1.60 × 10 6 μm 2 /s

Furthermore, a paired Monte Carlo sensitivity analysis was used to compare fitting methods. The results indicate that the single-step global method is substantially less sensitive to measured thickness variation compared to the traditional two-step Arrhenius procedure.

Background and Context

The study focuses on the bonding interface between indium TIM and Au/Ni-plated copper heat spreaders. Understanding the phase evolution of IMCs is critical for low-temperature reflow processes, as the transition from discrete grains to continuous layers affects the structural integrity of the thermal bond.

Significance and Outlook

These results clarify the correlated evolution of AuIn 2 and (Ni,Au) 3 In 7 during the bonding process. Beyond the material science findings, the research demonstrates the utility of single-step global fitting for kinetic analysis, particularly when working with limited temperature–time datasets, providing a more robust analytical framework for engineers and researchers.

Source: https://www.jstage.jst.go.jp/article/matertrans/advpub/0/advpub_MT-M2026110/_article

Collected: November 07, 2026 | Automated Research System (AI)

#02 Bio-inspired Leather: Bacterial Cellulose and Soybean Oil Specs

Published November 04, 2026 BIOENGINEER.ORG China



OVERVIEW

Researchers in China have developed a flexible bio-inspired leather composite using bacterial cellulose, collagen, and a bio-based adhesive made from epoxidized soybean oil and citric acid. The material achieves a tensile strength of 57.3 megapascals and significantly improves water resistance and flexibility compared to untreated bacterial cellulose. This composite offers a renewable alternative to natural leather with mechanical properties that overlap with typical leather ranges.

IN DEPTH

Key Findings

The engineered composite reaches a tensile strength of 57.3 megapascals and an elongation at break of 32.2 percent. By utilizing a woven fabric substrate, the material achieves a tear strength of approximately 50 newtons per millimeter and peel strengths between 8 and 9 newtons per millimeter, exceeding the 3 to 5 newtons per millimeter benchmarks required for leather bags and shoe uppers.

Technical Details

The material is constructed by coating a bacterial cellulose–collagen layer with a bio-based adhesive and pressing it onto a fabric substrate at 95 degrees Celsius under 1.0 megapascal for 5 minutes, followed by a 12-hour cure at 90 degrees Celsius. The adhesive is a cross-linked network formed by heating epoxidized soybean oil (ESO) with an aqueous citric acid solution. The optimal formulation, ESO-30/CA, contains 30 grams of epoxidized soybean oil and reaches gelation in 60 minutes at 90 degrees Celsius.

Water resistance is significantly enhanced through the adhesive's non-polar alkyl chains and ester groups. While untreated bacterial cellulose has a water contact angle of 32.7 degrees, the cured adhesive alone reaches 118.8 degrees. In water soaking tests, the final composite gained only 1.54 percent mass in the first 2 hours.

Background & Context

Bacterial cellulose is a renewable alternative to mycelium materials because it is produced in static liquid cultures over days to a week. However, it is naturally brittle after drying and highly hydrophilic. Previous attempts to improve this using collagen and tannic acid achieved a tensile strength of 53.42 megapascals but remained prone to wrinkling and water absorption.

Significance & Outlook

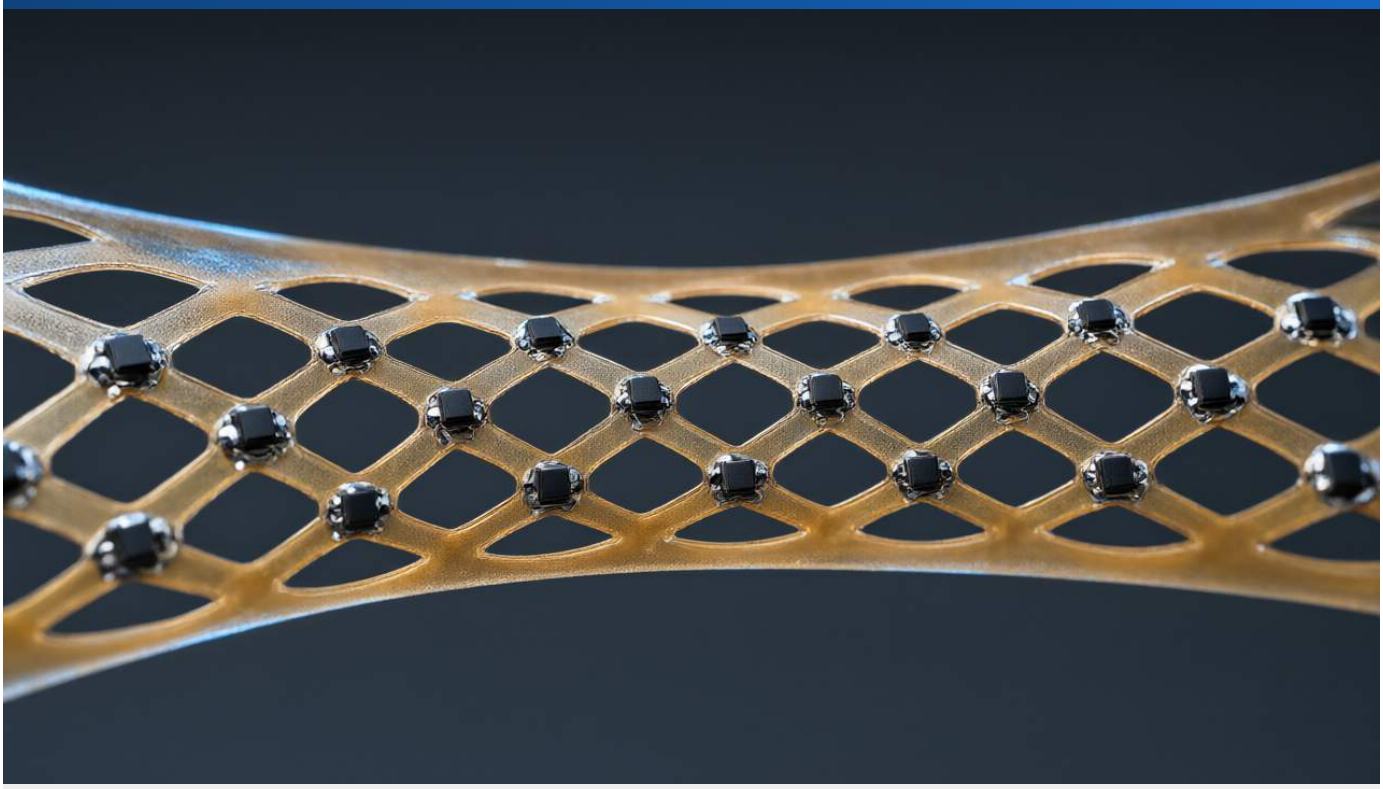
Ashby plots indicate that the composite's tensile strength, Young’s modulus, and density overlap significantly with natural leather. While flexibility and wrinkle resistance are improved—with woven and non-woven substrates reaching delayed recovery angles near 100 degrees—long-term durability remains a constraint, as surface cracking appeared after 5000 flexing cycles in a leather flexometer.

Source: https://bioengineer.org/bacterial-cellulose-and-soybean-oil-adhesive-yield-flexible-bio-inspired-leather/

Collected: November 07, 2026 | Automated Research System (AI)

#03 Liquid Metal Interfaces: Mounting Rigid Components on Kirigami Substrates

Published October 30, 2026　npj Flexible Electronics（Nature Portfolio）　Japan



OVERVIEW

Researchers have developed a liquid metal electrical interface material (LM-EIM) that enables the mounting of rigid electronic components on kirigami stretchable substrates without reducing stretch tolerance. The LM-EIM exhibits stretch tolerance 24 times higher than solder and 35 times higher than conductive adhesives, allowing for the integration of high-performance components into multifunctional stretchable electronics.

IN DEPTH

Key Findings

The study demonstrates that using liquid metal as an electrical interface material (LM-EIM) prevents the loss of stretchability typically caused when mounting rigid components on kirigami-based substrates. While traditional mounting materials like solder and conductive adhesives reduce substrate stretch tolerance to 32% and 36% of the original value respectively, the LM-EIM does not reduce this tolerance. In fact, the substrate fracture strain reached 3.99, which is 1.1 times the value of a substrate without components.

Technical Details

The LM-EIM provides significantly higher deformability compared to conventional rigid electrical interface materials. Specifically, its stretch tolerance is 24 times that of solder and 35 times that of conductive adhesives. By reducing mechanical constraints on the kirigami deformation, the LM-EIM suppresses fractures during stretching. The researchers validated this approach by integrating various components:

- A resistor array maintained electrical connectivity up to a device strain of 2.0.
- An LED array operated stably up to a strain of 1.5.

Background and Context

Kirigami structures allow sheets made from materials with low stretchability to achieve high stretch tolerance through local twisting and bending. However, the integration of rigid electronic components usually requires rigid interface materials. These materials mechanically constrain the kirigami deformation, leading to fractures at low strains and neutralizing the inherent advantages of the kirigami architecture.

Significance and Outlook

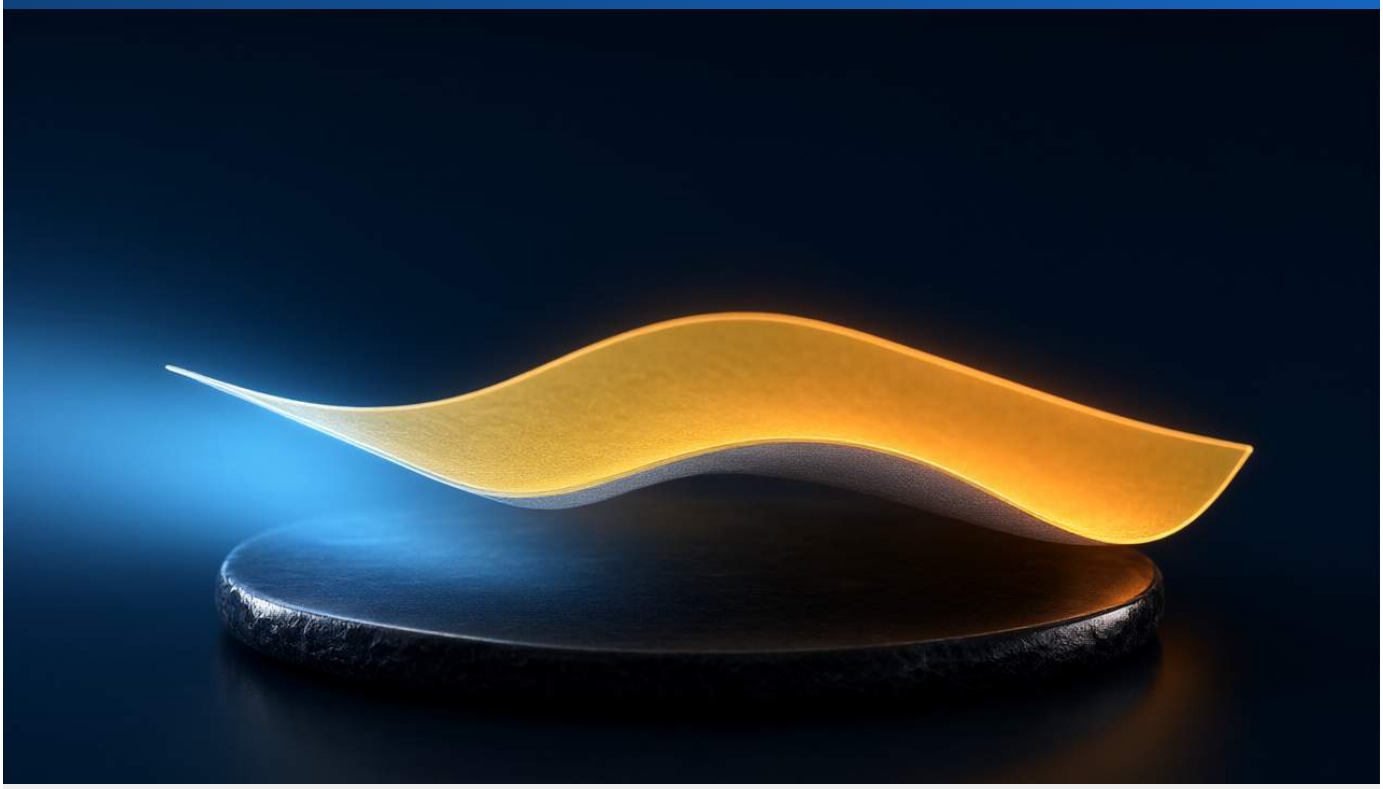
This interface approach allows for the integration of rigid, high-performance components onto highly stretchable kirigami sheets without sacrificing their mechanical properties. This development enables the creation of high-performance, multifunctional stretchable electronics that can withstand significant deformation while maintaining electrical stability.

Source: https://doi.org/10.1038/s41528-026-00662-1

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#04 Aramid Nanofiber Films: High-Performance Heat Dissipation and EMI Shielding Specs

Published November 03, 2026 국제뉴스 (Gukje News） South Korea



OVERVIEW

Researchers at Korea National University of Transportation have developed an ultra-thin composite film using decomposed and recombined Kevlar fibers. The film achieves over 99.999% electromagnetic interference (EMI) shielding and maintains 95% performance after 10,000 bending cycles.

IN DEPTH

Key Findings

Professor Sung-Ryong Kim's research team at Korea National University of Transportation has successfully fabricated an ultra-thin composite film that simultaneously provides high thermal dissipation, electromagnetic wave shielding, and durability. The film, developed by decomposing Kevlar fibers into nano-sized components and recombining them, demonstrates an EMI shielding effectiveness of over 99.999% even at a thickness comparable to a human hair. Furthermore, the material exhibits high mechanical durability, retaining approximately 95% of its initial performance after 10,000 repeated bending tests.

Technical Details

To overcome traditional trade-offs between strength and flexibility, the team focused on improving the alignment and bonding methods of aramid (Kevlar) nanofibers rather than increasing additive content. The researchers addressed a common issue where using water for film reconstruction caused rapid bonding and non-uniform structures. By replacing water with a mixed solution of acetic acid and alcohol, the team controlled the coagulation speed of the nanofibers. This allowed the fibers to align sufficiently and form bonds gradually, resulting in a denser and more uniform internal structure.

This optimization led to the following technical improvements:

- Thermal transfer performance increased by more than two times compared to existing methods, without the need for additional additives.
- Enhanced mechanical strength.
- Integration of graphene nanoplatelets to create a multifunctional composite film with simultaneously improved thermal conductivity, strength, and toughness.

Background and Context

The research was conducted as an international collaboration involving the CRANN Institute at Trinity College Dublin in Ireland and the Pontifical Catholic University of Peru (PUCP). The project received funding through the Mid-Career Researcher Support Program of the National Research Foundation of Korea and the Small and Medium Business Technology Innovation Development Project of the Ministry of SMEs and Startups. The findings were published online in the journal *Advanced Composites and Hybrid Materials*.

Significance and Outlook

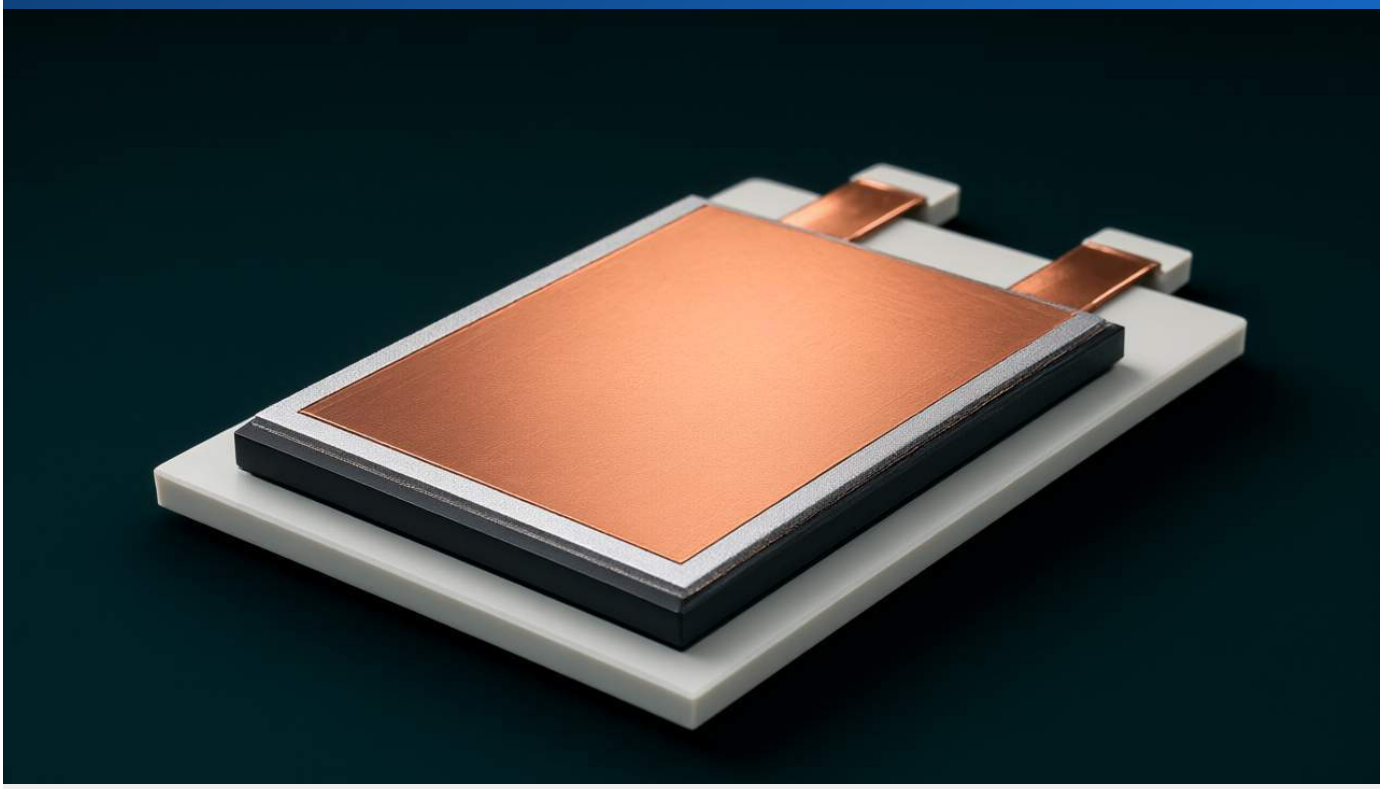
Professor Sung-Ryong Kim noted that the study provides a new material design method to secure both thermal conductivity and strength by controlling the bonding time between fibers. Researcher Muhammad Yasir added that this molecular-level structural design approach enables the development of various other high-performance composite materials.

Source: https://www.gukjenews.com/news/articleView.html?idxno=3740665

Collected: November 07, 2026 | Automated Research System (AI)

#05 MacDermid Alpha BondPad: SiC Die-Topside Sintering Specs for 2026

Published November 04, 2026 Compound Semiconductor USA



OVERVIEW

MacDermid Alpha is introducing BondPad, a copper-foil solution using Argomax sinter film for high-reliability SiC package die-topside attach. The technology demonstrates a 30-fold increase in lifespan over conventional aluminium wirebonding under specific power-cycling tests. This approach enables manufacturers to transition to sintered interconnects while utilizing existing wire-bonding infrastructure.

IN DEPTH

Key Findings

MacDermid Alpha will showcase BondPad at electronica 2026 (November 10–13 in Munich), a solution designed for sintered die-topside attach in high-power SiC packages. In power-cycling tests conducted at 180A with a 110°C temperature swing and a maximum junction temperature of 175°C, BondPad achieved more than 75,000 cycles. This compares to 2,500 cycles for standard conventional aluminium wirebond references, representing approximately 30 times longer life based on a 5 percent increase in drain-to-source voltage as the failure criterion.

Technical Details

The BondPad solution integrates a 50 µm nominal copper foil with a proprietary Argomax silver sinter film. During the sintering process, the Argomax layer creates a metallurgical bond with the die topside, resulting in a consistent sintered bond line of approximately 20 µm. The exposed copper surface then serves as a landing area for subsequent copper wire or copper ribbon bonding.

Compared to silver sinter paste-based methods, the film-based approach provides several technical advantages:

- Control of bond line thickness.
- Elimination of print and dispense dimensional variability.
- Reduction in overall processing time.

Background and Context

As SiC power devices enable higher operating temperatures and switching frequencies, the industry is shifting away from conventional solder and aluminium wire-bonding. Manufacturers are increasingly adopting sintered die attach and die-topside interconnects to withstand demanding thermal-cycling conditions. BondPad is designed to simplify this transition by supporting machine placement from tape-and-reel, allowing for automated assembly using established wire-bonding equipment.

Significance and Outlook

By extending silver sintering technology to the die-topside interconnect, MacDermid Alpha aims to improve power module reliability and process control as power density increases. Alongside BondPad, the company is exhibiting other sintering and solder products, including ALPHA ARGOMAX AccuLam 8022 silver sintering film for die attach and ALPHA TrueHeight Solder Preforms for bond line control.

Source:
https://compoundsemiconductor.net/article/125787/MacDermid_Alpha_to_show_new_SiC_module_tech_at_ele

Collected: November 07, 2026 | Automated Research System (AI)

#06 Polyolefin Upcycling: ETH Zurich's Process for High-Value Adhesives

Published November 05, 2026 ETH Zurich Switzerland



OVERVIEW

Researchers at ETH Zurich have developed a single-step process to upcycle polyethylene (PE) and polypropylene (PP) waste into high-performance adhesives. The method grafts additional polymer chains onto plastic waste using chlorinated solvents and light, enabling the creation of materials suitable for industrial load-bearing joints.

IN DEPTH

Key Findings

A research team led by Professor Tae-Lim Choi at ETH Zurich has patented a method to upcycle polyolefins—specifically polyethylene and polypropylene—into higher-value products. The primary demonstration of this technology is the production of high-performance adhesives from standard plastic bottles and bags. These adhesives exhibit strength levels that meet industrial requirements for high-stress and load-bearing joints used in equipment and vehicle manufacturing.

Technical Details

The process utilizes chlorinated solvents and short-wavelength light to initiate the upcycling. The mechanism operates as follows:

- Irradiation of chlorinated solvents generates highly reactive chlorine atoms (radicals).
- These radicals transfer reactivity to carbon atoms within the polyolefin chains, creating carbon radicals.
- These sites serve as starting points for the synthesis of additional polymer chains in a single step.

The process is precisely controllable; researchers adjust the wavelength of light and the degree of solvent chlorination to determine the number of activated grafting sites. This method avoids the need for high process temperatures, expensive catalysts, or specialty reagents.

Background and Context

Approximately 450 million tonnes of plastics are produced annually, with polyolefins accounting for roughly half of plastic consumption. Traditional recycling of these materials often results in "downcycling," where heating and dyes reduce material quality, limiting reuse to low-grade items like paving slabs. While pyrolysis can break polyolefins down into monomers, it is an energy-intensive process. The ETH Zurich method provides an alternative by altering functionality without requiring complete breakdown to monomers.

Significance and Outlook

Beyond adhesives, the ability to graft various chemical functionalities—including acids, bases, and polar groups—allows for a wide spectrum of applications. Potential future developments include polyethylene packaging that is impermeable to oxygen and waterproof. The researchers have already established industry contacts to explore these applications in food packaging.

Source: https://ethz.ch/en/news-and-events/eth-news/news/2026/11/how-plastic-waste-transforms-into-higher-value-products.html

Collected: November 07, 2026 | Automated Research System (AI)

#07 PGa III Hydrogel: Slug-Inspired Endoscopic Fistula Repair Specs

Published November 05, 2026 Chinese Academy of Sciences China



OVERVIEW

Researchers have developed PGa III, a thermoresponsive Janus-adhesive hydrogel that seals gastrointestinal fistulas via a minimally invasive endoscopic procedure. In animal models, the sealant demonstrated superior recovery rates and lower mortality compared to sutures and fibrin glue, offering a potential alternative to stents and titanium clips.

IN DEPTH

Key Findings

The PGa III sealant achieved complete closure of a 20-mm gastric fistula in a Bama pig model within 14 days, with repair quality exceeding that of titanium clips. In rat gastric fistula models, the PGa III group showed a postoperative mortality rate of 3.3%, significantly lower than the 6.7% for sutures and 56.7% for fibrin glue. Furthermore, the hydrogel resulted in almost no postoperative adhesion and near-complete recovery of the gastric wall structure by day 21.

Technical Details

Inspired by the mucus of jungle slugs, the researchers combined linear poly(N-isopropylacrylamide) (PNIPAM) with Ga 3+. The material remains a flowing liquid at 25 °C, allowing delivery through a 27-gauge needle and standard endoscopic channels, but transforms into a gel within approximately 30 seconds upon reaching body temperature (37 °C).

- **Asymmetric Adhesion:** The "slug-inspired electrostatically assisted topological (SET) Janus adhesion" mechanism creates a surface that is sticky on the tissue-facing side and non-adhesive on the lumen-facing side. In vitro, the adhesive side showed a shear strength of 10.46 kPa, nearly 100 times higher than the non-adhesive side (0.11 kPa).
- **Environmental Stability:** Unlike commercial fibrin glue, PGa III's adhesion strength and burst pressure increase after immersion in simulated gastric acid (pH 1.0).
- **Physical Properties:** The gel shrinks by approximately 51.6% at body temperature, creating a centripetal traction force that prevents the fistula from widening.
- **Antimicrobial Effect:** Ga 3+ provides an inhibition efficiency of about 98.6% against Staphylococcus aureus and Escherichia coli.

Background & Context

Gastrointestinal fistulas—abnormal passages between the digestive tract and other tissues—are often caused by trauma, surgery, or tumors. Current endoscopic treatments, including stents, titanium clips, and suturing, are limited by migration, recurrence, and technical complexity.

Significance & Outlook

This study, published in Nature Biomedical Engineering on October 30, provides a ready-to-use biosealant for minimally invasive surgery. Future research will focus on the metabolism and clearance of Ga^{3+} in large animals and the impact of pH fluctuations on degradation to facilitate clinical translation.

Source: https://english.cas.cn/newsroom/research-news/202611/t20261104_1213187.shtml

Collected: November 07, 2026 | Automated Research System (AI)

#08 Supreme 17HTMed: Medical Grade Epoxy Specs and Thermal Limits

Published October 30, 2026 Master Bond USA



OVERVIEW

Master Bond has developed Supreme 17HTMed, a one-component toughened epoxy for medical device bonding and sealing that withstands temperatures up to 550°F. The material is 100% reactive, non-cytotoxic per ISO 10993-5, and resistant to repeated sterilization. This combination of thermal stability and biocompatibility enables its use in demanding medical environments requiring aggressive chemical or autoclave sterilization.

IN DEPTH

Key Findings

Supreme 17HTMed is a one-component, toughened epoxy system designed for medical device applications. Its primary technical advantage is a wide service temperature range from -100°F to +550°F (-73°C to +288°C) and a high glass transition temperature (Tg) of 208–210°C. The material is 100% reactive, containing no solvents or diluents, and has passed ISO 10993-5 testing for non-cytotoxicity.

Technical Details

The cured system exhibits the following mechanical properties at 75°F:

- Lap shear strength: 1,900–2,100 psi
- Tensile strength: 7,000–8,000 psi
- Compressive strength: 16,000–18,000 psi
- Shore D hardness: 80–90

Electrically, the epoxy acts as an insulator with a volume resistivity exceeding 1015 ohm-cm at 75°F. It has a moderate viscosity of 100,000–150,000 cps at 75°F. To initiate the cure, heat is required; recommended schedules are 4–6 hours at 300°F or 2–4 hours at 350°F, with an optional post cure of 4–8 hours at 300–350°F for optimum properties.

Background and Context

As a toughened formulation, Supreme 17HTMed is engineered to withstand thermal cycling and bond dissimilar substrates, including ceramics, metals, composites, and various plastics. Because it is a single-component system, it requires no mixing prior to use and offers an unlimited working life at room temperature. For storage, the product can be kept refrigerated at 40°F to 50°F.

Significance and Outlook

The ability of Supreme 17HTMed to withstand repeated sterilization—including autoclaving and exposure to aggressive chemical sterilants like glutaraldehyde—makes it suitable for high-reliability medical components. Its capacity to maintain structural integrity across extreme temperature fluctuations while ensuring biocompatibility addresses specific sealing and bonding challenges in medical device manufacturing.

Source: https://www.masterbond.com/newsrelease/supreme-17htmed

Collected: November 07, 2026 | Automated Research System (AI)

#09 Changan Auto: Vision AI Gluing Robot and 8% Efficiency Gain

Published November 06, 2026 Gasgoo China



OVERVIEW

Changan Automobile has deployed its first vision AI adhesive application robot at the Liangjiang Plant to optimize the PVC undercoat gluing process. The system utilizes deep Convolutional Neural Networks (CNN) to increase hourly output (JPH) by approximately 8% while achieving risk detection accuracy exceeding 99.5%.

IN DEPTH

Key Findings

Changan Automobile has commissioned a vision AI gluing robot for painting operations at its Liangjiang Plant, resulting in a production line efficiency increase of roughly 8% in terms of jobs per hour (JPH). The integration of AI visual recognition allows for real-time monitoring of the gluing state with millisecond-level response times, shifting quality management from post-production inspection to active process monitoring.

Technical Details

The system addresses the complexities of the PVC undercoat gluing process, which is typically characterized by tight working spaces, complex application paths, and wide variations between vehicle models. To overcome traditional robotic limitations regarding nozzle calibration, angle adjustment, and trajectory fine-tuning, Changan implemented an AI visual inspection system powered by deep Convolutional Neural Networks (CNN).

Following hundreds of alignment tests, sealant validations, and trajectory debugs, the system optimizes the following parameters:

- Robot coordinates
- Nozzle posture
- Travel paths

These optimizations enable the robot to adapt to the specific undercoat gluing requirements of various vehicle models. Furthermore, the system's risk detection and reporting accuracy now exceeds 99.5%.

Background & Context

The deployment of the painting gluing robot is part of a broader strategy to integrate AI vision technology across multiple production stages. Changan had previously deployed visual inspection systems for stamping and welding operations at the Liangjiang Plant.

Significance & Outlook

The successful implementation of this technology alleviates existing bottlenecks in the PVC process. By extending AI vision into the painting stage, Changan has expanded the scope of AI-driven manufacturing execution and quality assurance within its production facilities.

Source: https://autonews.gasgoo.com/articles/news/changan-auto-deploys-first-vision-ai-adhesive-application-robot-boosting-line-efficiency-by-8-2118544469233922049

Collected: November 07, 2026 | Automated Research System (AI)

#10 ETH Zurich Plastic Adhesive: Upcycling Polyolefins for High-Strength Bonding

Published November 06, 2026 Forschung und Wissen Germany



OVERVIEW

Researchers at ETH Zurich have developed a method to transform waste polyethylene and polypropylene into a high-performance adhesive capable of lifting 20 kilograms with just 13 milligrams of material. By using light-induced chemical modification to add polar polymer side chains, the team has converted non-polar plastic waste into a technical material that bonds strongly to metal, glass, and wood.

IN DEPTH

Key Findings

A research team led by polymer chemist Tae-Lim Choi at ETH Zurich has successfully produced a high-performance adhesive from used polyolefins, specifically polyethylene and polypropylene sourced from plastic bags, bottles, and laboratory vessels. In stress tests, 13 milligrams of this adhesive were sufficient to lift a 20 kilogram weight. The material demonstrated high adhesion to aluminum, stainless steel, copper, and wood; in some cases involving glass, the glass samples fractured before the adhesive bond failed.

Technical Details

The process, developed significantly by Hongsik Kim, utilizes chlorinated aromatic solvents that form short-lived chlorine radicals under light reaction. These radicals remove hydrogen atoms from the carbon chains of the plastic, creating active centers where vinyl monomers can attach and grow into long polymer side chains. To ensure precise control, the team used 390 nanometer violet light to regulate the amount of radicals produced.

- **Mechanism:** The addition of polar groups to the previously non-polar, chemically inert surface of the polyolefins increases interaction with other materials.
- **Performance:** A variant featuring poly(N-ethylacrylamid) side chains achieved a strength of 13.4 megapascal in shear tests on aluminum, surpassing commercial hot-melt adhesives.
- **Durability:** The adhesive retained 88 percent of its bonding strength after exposure to a water bath.

Background and Context

Unlike traditional pyrolysis, which uses heat to break plastics down into smaller hydrocarbons for raw material reprocessing, this method preserves the existing polymer as a supporting structure. This targeted functionalization avoids the complete decomposition of the plastic chains. The researchers scaled the process from tiny samples to a double-digit gram range to prove that light could penetrate the reaction mixture due to the optical properties of the chosen solvent.

Significance and Outlook

The process is notable for requiring no metal catalysts or specialized radical starters. However, the use of chlorinated solvents remains a technical hurdle, as these must be safely managed and recovered in industrial applications. Pilot plants will be necessary to determine if the process is economically viable for high-throughput industrial use.

Source: https://www.forschung-und-wissen.de/nachrichten/chemie/13-milligramm-plastik-kleber-heben-20-kilogramm-gewicht-133715537

Collected: November 07, 2026 | Automated Research System (AI)