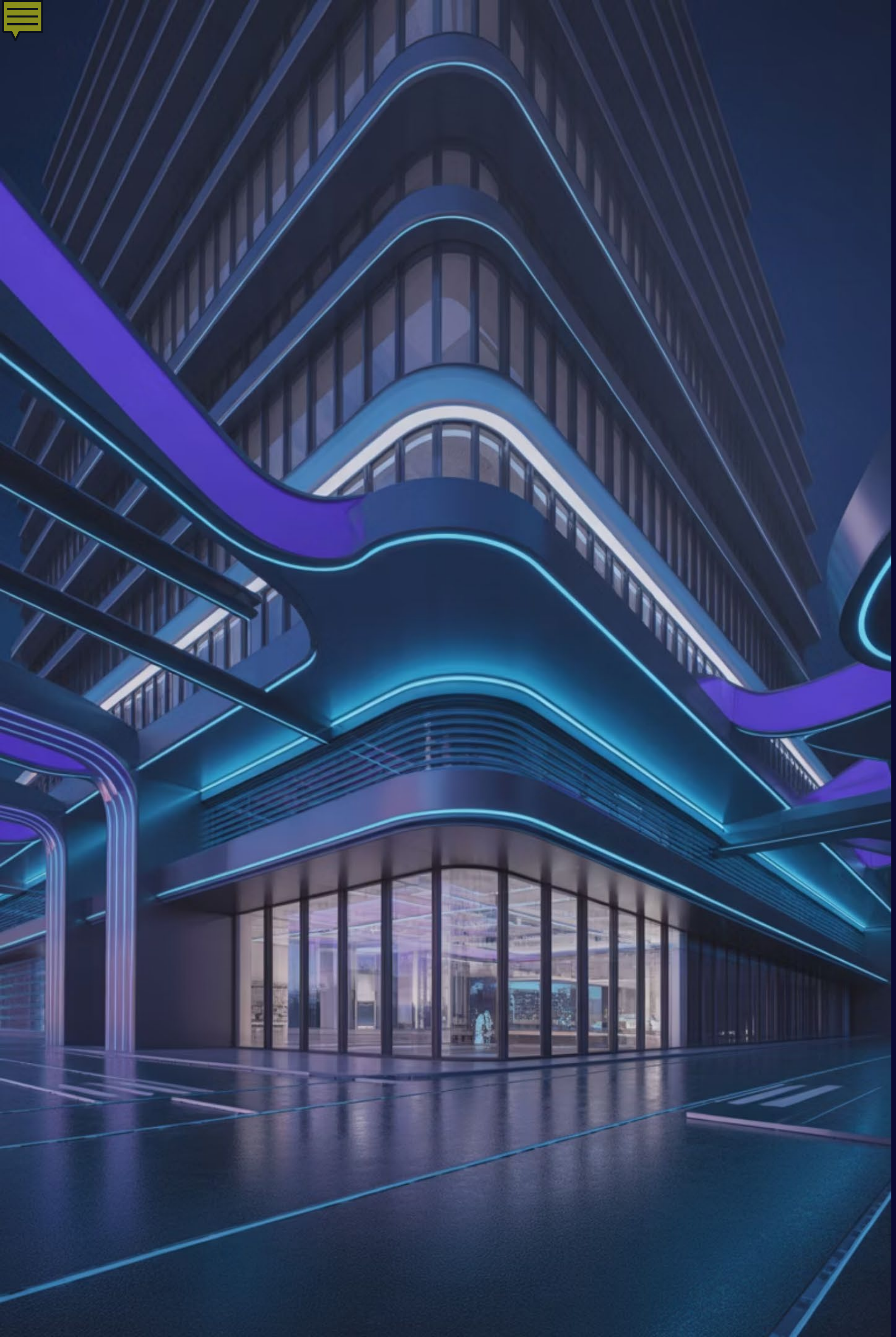

Smart Non-Woven Surfaces: IoT-Enabled Materials Engineering for Sustainable, Connected Environments

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Conf42.com Robotics 2025

The Infrastructure Challenge in Smart Environments

Traditional Limitations

Legacy building surfaces present critical barriers to IoT deployment. Conventional vinyl wallcoverings emit harmful VOCs, limit wireless signal transmission, and cause wall damage during removal processes.

These materials fail to support embedded sensors, RFID tracking systems, or QR-coded automation protocols essential for modern robotics ecosystems.

The Smart Surface Imperative

Next-generation infrastructure demands materials that actively enable connectivity whilst maintaining environmental compliance. Smart buildings require surfaces that integrate seamlessly with automation systems, support edge-device compatibility, and eliminate chemical hazards, all whilst delivering repositionable installation and damage-free removal capabilities.

Three Engineering Breakthroughs Redefining Surface Materials

Nano-barrier Coatings

Water-based formulations achieving moisture vapor transmission below 0.5 $g/m^2 \cdot day$, validated per ASTM E96 standards. Performance rivals' traditional vinyl under extreme humidity conditions without VOC emissions.

Microsphere PSA Technology

Pressure-sensitive adhesives optimized for IoT environments, tested under PSTC and ASTM protocols. Maintains adhesion strength above 12 N/25mm whilst enabling complete repositionability and damage-free removal.

Multi-Method Printability

Engineered substrate compatibility across inkjet, flexographic, and digital UV workflows. Enables integration of embedded sensors, RFID tags, and machine-readable tracking systems for automation.

Water-Based Nanobarrier Technology: Performance Without Compromise

Our water-based nanobarrier platform delivers superior moisture barrier performance, rivaling traditional solvent-based vinyls, without the VOC emissions or disposal challenges.

01

Nano-Particle Engineering

Engineered nanoparticles block moisture at a molecular level.

02

ASTM E96 Validation

Validated to ASTM E96; MVTR below 0.5 $g/m^2 \cdot day$.

03

High-Humidity Performance

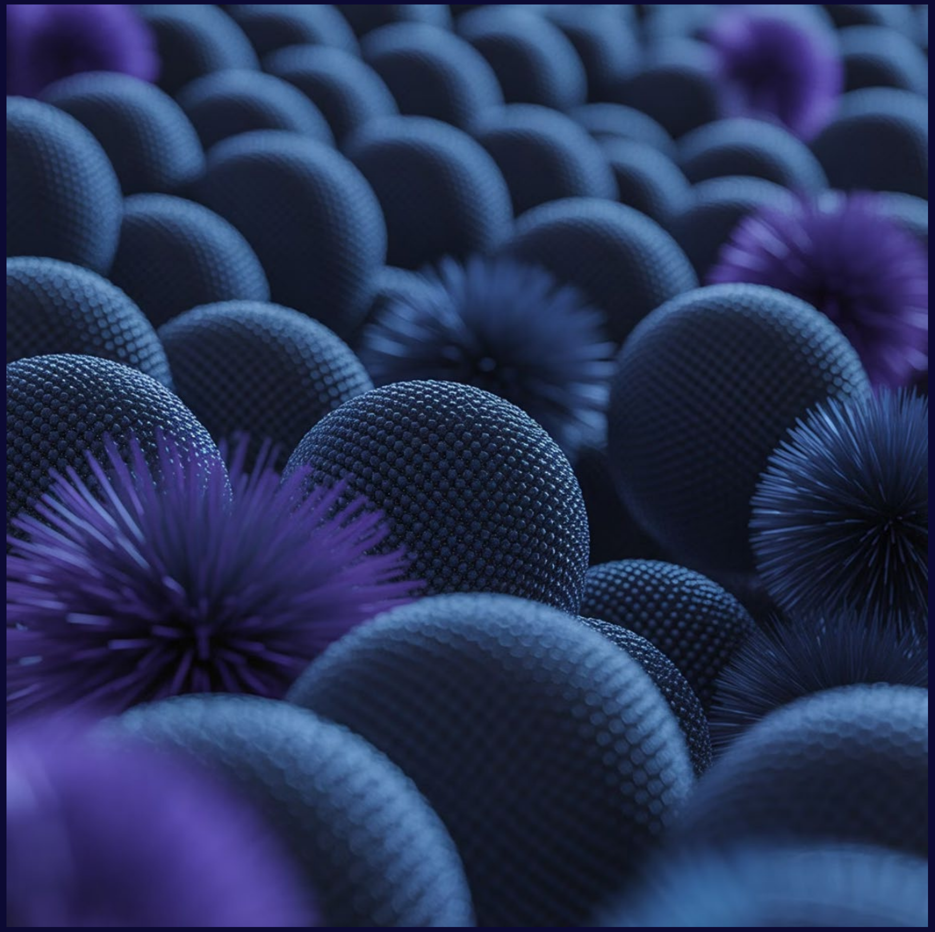
Maintains integrity in demanding, high-humidity environments.

04

Zero-Solvent Formulation

Zero-solvent formula eliminates VOCs and manufacturing emissions.

Microsphere PSA: Redefining Adhesion for Smart Infrastructure



Engineering Repositionability

Conventional permanent adhesives create irreversible bonds that damage substrates and prevent infrastructure updates. Microsphere pressure-sensitive adhesive technology enables multiple repositioning cycles whilst maintaining structural integrity.

The system employs precisely engineered polymer microspheres that create discrete contact points rather than continuous adhesion layers. This architecture delivers adhesion strength exceeding 12 N/25mm validated per PSTC 101 and FINAT test methods, whilst allowing clean removal without surface damage or residue.

For IoT-enabled environments requiring frequent sensor updates or infrastructure modifications, this repositionability eliminates costly surface preparation and reduces building downtime during technology upgrades.

HYBRID - Printability: The Foundation for Smart Integration

Inkjet Compatibility

Optimized surface energy enables high-resolution digital printing for custom sensor integration and facility-specific automation protocols

Flexographic/ Rotary Screen Production

Supports high-volume manufacturing with embedded RFID substrates and conductive ink pathways for large-scale deployments

Digital UV Systems

Instant curing enables rapid prototyping of IoT-tagged surfaces with machine-readable QR codes and tracking matrices

IoT Integration: Enabling Connected Robotics Ecosystems

Smart building automation and robotics deployment require surfaces that actively support connectivity infrastructure rather than impede it. This platform delivers three critical capabilities for IoT-enabled environments.

1

Wireless Signal Transparency

Non-metallic substrate composition ensures minimal RF interference, maintaining signal strength for wireless sensors, BLE beacons, and mesh networking protocols essential for robotic navigation

2

Embedded Sensor Integration

Printability across multiple workflows enables direct integration of temperature sensors, humidity monitors, and occupancy detectors within the surface material itself

3

Machine-Readable Identification

QR codes, RFID tags, and NFC elements can be embedded during manufacturing, creating a spatial positioning system for autonomous robots and asset-tracking automation

Rigorous Environmental Compliance: Meeting Global Sustainability Mandates

CDPH 01350 Compliance

Meets California's strict VOC emission standards, with emissions below detection. Qualifies for LEED v4 credits, ensuring occupant safety.

Class A Fire Performance

Achieves highest fire safety rating without halogenated flame retardants. Provides inherent fire resistance and eliminates toxic byproducts.

Chemical Hazard Elimination

Verified free of phthalates, halogens, and heavy metals. Complies with European REACH and supports WELL Building Standard.

Performance Validation Through Standards-Based Testing

Key Testing Protocols

- ASTM E96: Moisture vapor transmission
- FINAT Adhesion Methods
- ASTM E84: Surface burning characteristics
- CDPH 01350: VOC emissions

Data-Driven Validation

Material performance is rigorously substantiated through third-party laboratory testing against international standards. Consistent performance is ensured via batch-level quality control.

Validation includes moisture barrier effectiveness across diverse climates, accelerated adhesion aging to simulate ten-year durability, and Class A fire performance, suitable for critical infrastructure like hospitals and schools.

Commercial Adoption: Validation Across Global Institutions

Deployed in over 50 institutional facilities across North America and Europe, our platform demonstrates technical viability and market acceptance in critical sectors like healthcare, education, corporate, and government.

1

Healthcare Deployment

Supports infection control with damage-free removal and zero VOC emissions. Features antimicrobial surfaces and integrates with hospital automation.

2

Educational Facilities

Enables flexible learning spaces with repositionable installation. Meets Class A fire ratings and supports sustainability goals.

3

Smart Office Integration

Embedded sensors aid occupancy analytics and HVAC optimization. Ensures uninterrupted connectivity via wireless transparency and rapid installation.

The Material Backbone of Connected Robotics Environments

Autonomous Navigation

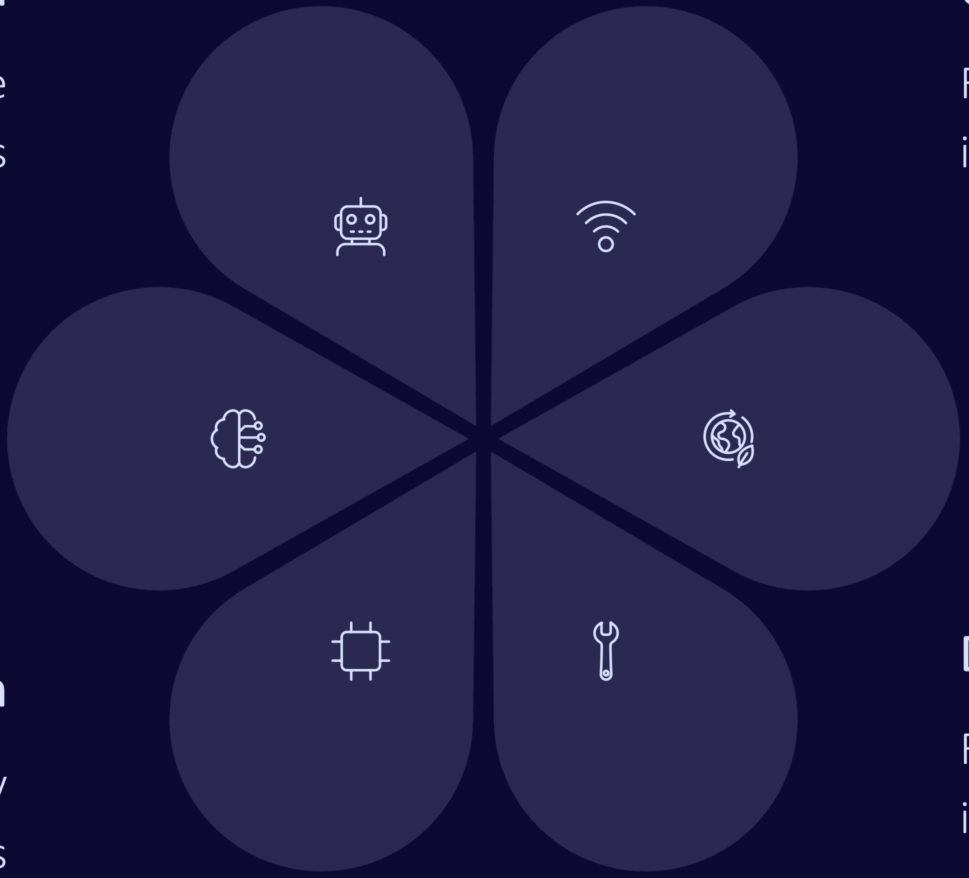
Machine-readable surface markers enable precise indoor positioning for mobile robots

Embedded Sensing

Printable substrate hosts environmental monitors for building automation systems

Asset Tracking Integration

Embedded RFID supports inventory automation and supply chain robotics



Connectivity Infrastructure

RF-transparent materials maintain signal integrity for wireless sensor networks

Environmental Compliance

Zero-emission installation meets green building mandates for automated facilities

Damage-Free Updates

Repositionable adhesion enables infrastructure modifications without costly surface repair

Strategic Adoption Framework: Accelerating Smart Infrastructure

Successful integration of advanced materials into IoT ecosystems requires systematic planning. Four key pillars enable effective deployment:

Requirements Alignment

Map material capabilities to specific automation requirements for robotic systems.

Cross-Functional Engagement

Coordinate across facilities, IT, sustainability, and robotics teams.

Pilot Validation

Implement controlled pilot installations to verify performance before full deployment.

Scalable Deployment

Develop protocols and training for rapid, quality-assured rollout across facilities.

Key Takeaways: Materials Engineering for the IoT Era

Smarter surfaces are essential infrastructure

IoT environments demand active materials that support connectivity, automation, and sustainability, crucial for robotics and smart buildings.

Data-driven validation builds confidence

Standards-based testing (ASTM, FINAT, CDPH) provides objective performance evidence, accelerating adoption and supporting green building certifications.

Multi-functional integration creates value

Materials combining barrier, repositionability, environmental compliance, and printability simplify procurement and deliver compounding benefits.

Commercial adoption proves market readiness

Deployment across 50+ institutions confirms advanced non-woven platforms meet real-world performance, automation, and sustainability needs.

Advancing Connected Environments Through Materials Innovation

Materials engineering is crucial for the convergence of robotics, IoT automation, and sustainable building practices. Smart non-woven surfaces serve as critical infrastructure, enabling wireless connectivity, embedded sensors, and environmental compliance that legacy products cannot provide. These engineered platforms accelerate the transition to intelligent environments, proving that successful robotics deployment relies on foundational materials for seamless integration.

Materials engineering is infrastructure engineering for the connected age.

Thank You!

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