CHASM™

The Best Flexible Printed Electronics You'll Never See

Make it with AgeNT™

Let’s Create Something Together

Your ideas. Our materials.

Together, we can turn your innovative concepts into reality. Are you ready to introduce your ideas to the world?

Let CHASM help.

Make it with AgeNT™

CHASM Advanced Materials, Inc. propels cutting edge product innovations through advanced materials hybridized at the nanoscale to exceed the design limitations imposed by existing materials.

Leading companies across multiple industries have fueled next-generation product innovations using AgeNT™ for transparent flexible printed electronics. CHASM's unique expertise in producing superior quality Nanotube Hybrids gives our printed electronics platform based on Nanotube Hybrid capabilities beyond any other commercially available alternative.

The AgeNT transparent conductive platform is flexible and formable with low pattering costs and superior optoelectronic performance of low sheet resistance at high transparency. Leading companies across multiple industries have successfully launched their next generation innovations using transparent touch sensors and buttons, heaters, antennas, and EMI shielding films made from advanced Nanotube Hybrids, CNT inks and Nanotube Hybrid materials only available from CHASM.

Simply put, CHASM's Nanotube Hybrid platform for transparent flexible printed electronics enables engineers in every industry to create the best flexible printed electronics they'll never see.

CHASM™

Printed Heaters

Benefits:

- Flexible, thermoformed for wider range of product designs; integration into headlights and curved glass surfaces
- Up to 3,000 watts/M^2; meeting specifications for warming time
- Up to 120 Degrees Celsius
- Obstruction free design (no microwire) for optimal pairing with Optical Cameras
- Screen Printable: Quick turnaround on circuit design changes and prototypes; just-in-time production runs
- Lower design cost and lower unit cost, no need for laser ablation, deposition and patterning

Optical cameras are becoming the technology of choice for collision avoidance, intrusion detection, security, inspection, and process control systems. Cameras can be used to detect precise objects and AI processing can create 3D environment maps in real time enabling drones to fly without collision and autonomous cars to discern a pedestrian from a bicyclist or even a pot hole from a guard rail. All of these systems will need to remain active even in harsh weather, so keeping their field of view clear from ice, rain, and condensation is imperative. CHASM's AgeNT transparent Nanotube Hybrid materials is the only commercially available transparent material capable of delivering the heat density required for these applications without wires.

A transparent electric heating film is typically constructed by "sandwiching" a conductive material between layers of glass or clear plastic, traditionally polycarbonate or acrylic. The challenge here is deploying a conductive material that has both sufficient conductivity AND transparency. Patterns or opaque layers affect visual performance, while insufficient conductivity limits heating speed and range. CHASM's AgeNT-10 TCF material is available at <10 ohms/square with greater than 90% visible light transparency, ideal for applications in avionics, transportation electronics, kiosks and more.

Make it with AgeNT™

Applications

Touch Sensors & Smart Surfaces

Touch, double-tap, or pinch, smartphones have cemented touch as a user's preferred method of interacting with electronic devices. Touch sensors and sliders have long been a staple for user interaction, but smart surfaces extend a once planar form factor to sculpted and organically shaped 3D surfaces. Flexible, foldable and even thermoformable, CHASM's AgeNT offers the perfect transparent conductive platform for touch sensors or buttons and the latest innovations in smart surfaces. AgeNT is a high performance transparent, conductive film that enables engineers to easily add interactivity through touch buttons or smart surfaces into an increasingly diverse range of user environments.

It is no longer enough to have combine mechanical switches and touch panels to create the "human-machine-interface". Touch buttons, sliders and traditional X-Y touch panels must be seamlessly integrated into devices, vehicles and appliances and they must incorporate more functionality in less space in a way that is easily accessible and ergonomically friendly. Achieving this level of adaptability will require manufacturing techniques and materials that are more versatile than ever before.

For touch sensor applications, CHASM offers AgeNT 75 for designs requiring robust performance or AgeNT VC102.

Benefits:

- Flexible, thermoformed for wider range of product designs
- Screen Printable: Quick turnaround on circuit design changes and prototypes; just-in-time production runs
- Lower design cost and lower unit cost, no need for laser ablation, deposition and patterning

Printed Antennas: IoT/DAS/NFC

Optimizing antenna design isn't merely a function of achieving the desired frequency spectrum. Antenna shape, material composition, or placement within an enclosure can impact performance and ultimate success of the end device employing the antenna. Even the required frequency can present challenges for engineers to overcome. For example, the roll out of 5G wireless offers performance benefits for consumers but creates technical challenges for carriers. The same millimeter wave technology enabling higher frequencies also creates interference problems with obstacles such as buildings, trees, and even rain. More antennas closer to points of use are needed to ensure line of site connections to users. The unique properties of our AgeNT transparent Nanotube Hybrid material enabled a national wireless carrier to deploy municipal Wi-Fi using transparent 5G antennas that unobtrusively blend in with their surroundings.

Design and integrate a functional antenna without it being obtrusive or sacrificing performance. Incorporate transparent, flexible antennas into appliances, lighting fixtures, and other home furnishings—even windows. AgeNT bridges the gap between technology and the human lifestyle.

Benefits:

- Sheet resistance 1ohm/sq
- 90% transparent
- Flexible, thermoformed for wider range of product designs
- Screen Printable: Quick turnaround on design changes and prototypes; just-in-time production runs
- Lower design cost and lower unit cost, no need for laser ablation, deposition and patterning

Make it with AgeNT™

Applications

Large Format Touch

Benefits:

- Screen Printable: Quick turnaround on circuit design changes and prototypes; just-in-time production runs, even coating for reliable sheet resistance across large surfaces
- Lower design cost and lower unit cost, no need for laser ablation, deposition and patterning
- Nanotube Hybrids provide a high degree of environmental stability for longevity and robust performance

Due to the prevalence and widespread adoption of mobile devices and tablets today's consumers expect a similar experience with any interactive product. Whether it is point-of-sale or an educational display, large format touch surfaces need to be fast, responsive and seamlessly interactive. Designing and manufacturing large format touch screen that reliably deliver to these expectations stretches the bounds of traditional materials. Ensuring consistent sheet resistance while balancing transparency of the touch layer becomes increasingly difficult with growing display sizes. Touch materials also need to be able to perform without failure even when they are repeatedly exposed to heat and humidity. Achieving the transparency, environmental stability and performance for next generation large format touch devices is now possible with CHASM's AgeNT platform of transparent conductive films.

For larger format touch applications from point-of-sale (POS) and kiosks to touch interactive walls, CHASM offers AgeNT-30.

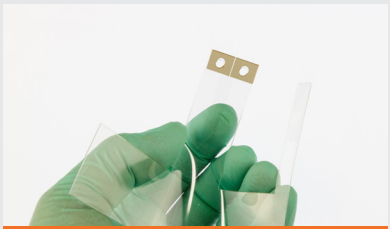
AgeNT-1

Applications:
Printable, Flexible, Transparent Antennas: DAS, IoT, NFC Antennas without the design boundaries!

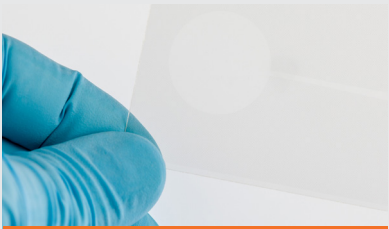
Specifications:

	G2	G3
Sheet Resistance:	1 Ω/□	0.2 Ω/□
VLT:	94%	84.4%
Total VLT:	87%	78.1%
Haze:	2.1%	3.5%
Total Haze:	3.7%	5.0%
Substrate:	4 mil PET	4 mil PET

Featuring our lowest available sheet resistance, AgeNT-1 is the optimal formulation when current carrying capacity is the critical design factor. AgeNT-1 is the only formulation based on a metal mesh (MM) substrate within CHASM's Nanotube Hybrid based printed electronics platform covering a range of formulations that balance transparency and conductivity for a wide range of applications. Available in two configuration of mesh pitch, only AgeNT-1 enables engineers or product designers to innovate transparent DAS, IoT, or NFC antennas that unobtrusively disappear into architectural elements like overhead lights, windows, or glazed artwork, putting more antennas closer to points of use to increase signal strength and data speeds.



AgeNT-1 Antenna



AgeNT-1 Antenna

AgeNT-1 Antenna

Make it with AgeNT™

Products

AgeNT VC102 Touch Buttons

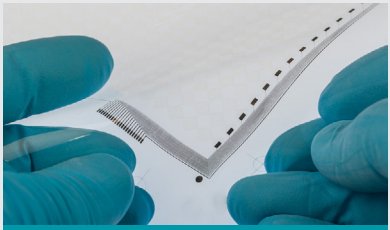
AgeNT VC102 Capacitive Touch

AgeNT VC102

Specially formulated from CHASM's patented V2V™ ink vehicle and industry leading single wall CNTs, VC102 delivers printable, flexible transparent conductors with superior environmental robustness and optical performance than commercial alternatives such as PEDOT. VC102 is well-suited for cost-effective transparent circuit production at high volumes for touch buttons and sensors used in many applications including appliances, automotive interiors, and industrial controls. Developed in direct response to repeated feedback from printed electronics manufacturers, VC102 balances value, printing consistency, simplicity of patterning and environmental stability. VC102 is well suited to high volume transparent FPC applications. Suitable for harsh environment applications, VC102 successfully completed 1,000 hours of environmental testing at 65°C / 85% RH, exhibited minimal variation in resistance while transparency, haze and color remained very stable.

Applications:
Transparent flexible touch buttons

Specifications:
Sheet Resistance (Typical Optoelectronic Values): 800 -1,000 Ω/□
VLT: 85%
Haze: 0.25
Substrate: PET, PC, Elastomer, Glass; inquire about additional options



AgeNT-75 Touch Screen

AgeNT-30 Capacitive Touch

AgeNT-75

Applications:
Printable, Flexible, Transparent Touch Sensors for Wearable Devices, Automotive, White Goods / Consumer Goods
Flexible Displays for Retail / Outdoor Advertising
RF Shielding

Specifications:
Sheet Resistance: 75 Ω/□
VLT: 98%
Total VLT: 89.9%
Haze: 0.2%
Total Haze: 1.4%
Substrate: 5 mil PET

Virtually invisible, AgeNT-75 offers industry leading transparency for your most demanding touch sensor, touch screen, or display applications. AgeNT-75 is the highest transparency formulation of CHASM's Nanotube Hybrid printed electronics platform covering a range of formulations that balance transparency and conductivity for a wide range of applications. Using AgeNT-75, engineers and product designers are free to implement interactive touch user interfaces on any surface including sculpted smart surfaces or on flexible/foldable displays.

AgeNT-30

Suitable for a variety of applications, AgeNT-30 is a versatile formulation within CHASM's Nanotube Hybrid printed electronics platform covering a range of formulations that balance transparency and conductivity for a wide range of applications. Consistent resistivity even at dimensions suitable for large format displays, AgeNT-30 still delivers the transparency required to not detract from advertising, point of sale, or gaming applications.

Applications:
Large Format Touch Screens & Smart Surfaces: kiosks, whiteboards, outdoor advertising | Heaters for Automotive Applications requiring high VLT

Specifications:
Sheet Resistance: 30 Ω/□
VLT: 95.8% | **Total VLT:** 87.8%
Haze: 1% | **Total Haze:** 2%
Substrate: 5 mil PET (also available on 7 mil PC)

Make it with AgeNT™

Products

AgeNT-10

Applications:
Printable, Flexible, Transparent Heaters for Automotive Applications: heated windshield, headlights
Any application requiring a transparent, flexible heater
Compatible with LIDAR and optical cameras

Specifications:
Sheet Resistance: 10 Ω/□
VLT: 90.9% | **Total VLT:** 83%
Haze: 3.3% | **Total Haze:** 3.7%
Substrate: 7 mil PC

The most conductive model utilizing a silver nanowire (AgNW) substrate, the AgeNT 10 formulation rounds out CHASM's Nanotube Hybrid based printed electronics platform covering a range of formulations that balance transparency and conductivity for a wide range of applications. AgeNT-10 is the only commercially available transparent conductor capable of producing a heat source sufficient to control ice, snow, and condensation without wires. Transparently heat windshields and headlights for not only defrosting or defogging, but also to clear ice or frost build up in inclement weather to ensure collision avoidance and safety systems using optical cameras remain operational. AgeNT-10 has demonstrated up to 3,000 watts/M2 and up to 120 degrees Celsius continuous operation in commercial automotive applications.

AgeNT-10 Heater

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