

Make it with  
**AgeNT™**

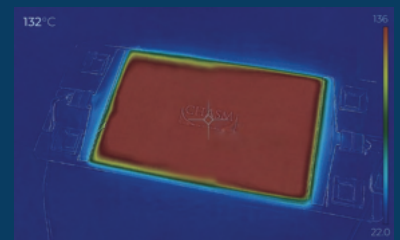
## Printed, Transparent Heaters

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, along with RADAR and LiDAR sensors, 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 CNT 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 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.



### Examples of CNT Hybrid Heaters:



### Benefits of CNT Hybrid Heaters:

Flexible, thermoformed for wider range of product designs;  
integration into headlights and curved glass surfaces

Up to 3,000 watts/M<sup>2</sup>;  
meeting specifications for warming time

Up to 120 Degrees Celsius

Obstruction free design (no microwire) for optimal pairing with Optical Cameras. RADAR and LiDAR

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