

# CHASM Ag<sup>e</sup>NT™-75

## Hybrid Transparent Conductive Films



### PRODUCT DESCRIPTION

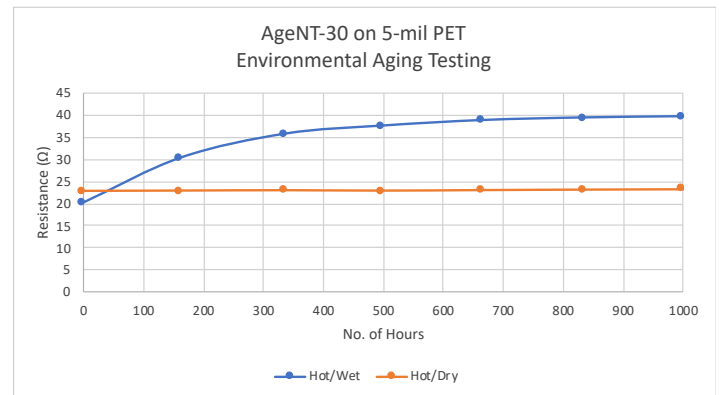
Ag<sup>e</sup>NT-75 is a CNT Hybrid Transparent Conductive Film (TCF) made by printing Carbon Nanotube (CNT) ink onto Silver Nanowire (AgNW) film to create a flexible TCF that is substantially better than either CNTs (more conductive) or AgNWs (more robust and lower cost patterning).

### HOW AGENT™ WORKS

CNT ink is formulated for screen printing and is comprised of a mixture of our singlewalled CNTs (CoMoCAT™ technology), an optically clear polymer binder and our proprietary ink vehicle (V2V™ technology). The grade of CNT ink that is used for making Ag<sup>e</sup>NT-30 product structures is CHASM-AGENT-VC200. CNT ink is available in standard 1L bottles.

AgNW film is made by coating AgNWs to random network of AgNWs on a continuous roll of clear plastic film substrate. AgNW layer is ~ 0.2µm thick. There is one substrate option for Ag<sup>e</sup>NT-75: 5-mil PET film with hard coat (HC) on the backside. The grade of AgNW film that is used for making Ag<sup>e</sup>NT-75 product structures is CHASM-AGENT-AW210. AgNW film is available in standard sheet size of approx. 300mm X 600mm and can also be provided in approx. 600mm or 1,200mm wide rolls.

### ENVIRONMENTAL



Resistance, adhesion and optical properties exhibit very stable behavior with environmental aging.

**Note: The test results shown reference AgeNT-30. Tests are underway for Ag<sup>e</sup>NT-75 and results are expected to be similar.**

### OPTOELECTRONIC PROPERTIES

	TCF + Substrate	TCF only
Sheet Resistance (Ω/□)	75	75
VLT (%)	89.9%	98.1%
Haze (%)	1.4%	0.2%
L*	95.30	-
a*	-0.37	-
b*	1.43	-

Optical properties measured by R-chek 4-point resistance meter, BYK Hazegard transparency meter or X-Rite spectrophotometer.

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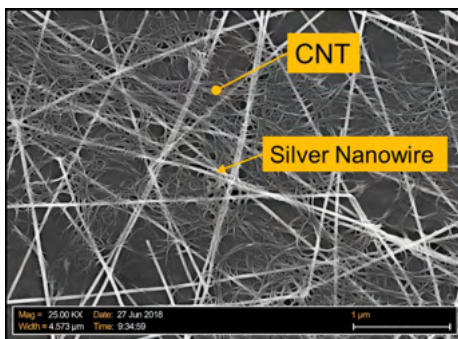
### AGENT-75 STACK

PE Release Liner
75 $\Omega/\square$ AgNW coating
5 mil PET Film
Hardcoat

AW210



Transparent capacitive touch sensors made from AgeNT-75 (image courtesy of ClickTouch)



### PRODUCT BENEFITS

- Low sheet resistance with extremely high optical transparency
- Low materials and processing costs for creating patterned TCFs
- Can be flexed or formed for flexible, wearable, or 3D products
- Resistance, adhesion and optical properties are very stable with environmental aging.

### TARGET APPLICATIONS

- Transparent Touch Sensors
- Touch Screens
- Transparent Electrodes for Biosensors
- Transparent Electrodes for Lighting

### FABRICATION PROCESS

Flexible printed circuit (FPC) patterns are created by:

1. screen printing CNT ink on top of the AgNW film
2. hot air drying at  $\sim 100^\circ\text{C}$ ;
3. chemically etching the exposed AgNW areas

Typical etchant is Ferric Nitrate (industry standard for etching Silver). This affordable circuit patterning process is suitable for mass production and is referred to as "Print / Etch / Done". It has fewer steps & less waste streams than photolithographic etching, and is much faster than laser ablation. The CNT ink is a multi-functional material that acts as a printed etch mask (for low-cost patterning) and also encapsulates the AgNWs (to create a more robust TCF).

**AgeNT-75:** 75  $\Omega/\square$  at 98% VLT

#### DISCLAIMER

The information provided in this Technical Data Sheet (TDS) including the recommendations for use and application of the product are based on CHASM's accumulated experience as of the date of publication. Product performance will vary based on application and operational environment, so CHASM Advanced Materials Inc. is not liable for the suitability of our product for the intended applications and results.

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