

## Hybrid Transparent Conductive Films

AgeNT-30 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).

## AgeNT-30 - 30 Ω/□ at 95% VLT

### Key Features

- ✓ 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

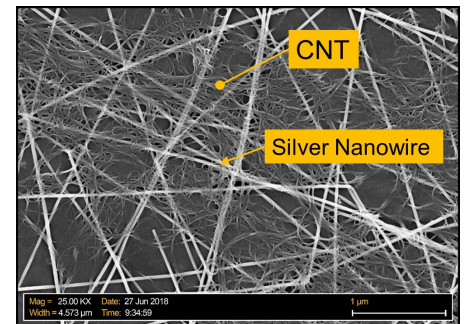
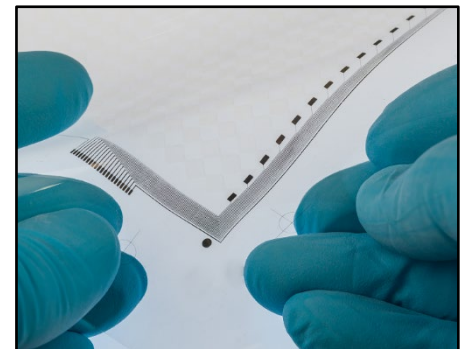
- ✓ Large Format Touch Screens
- ✓ Touch Sensors
- ✓ Transparent Heaters
- ✓ Transparent Electrodes for Lighting

### How AgeNT Works

CNT ink is formulated for screen printing and is comprised of a mixture of our single-walled 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 AgeNT-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 ~ 0.3µm thick. There are two substrate options for AgeNT-30: 1) 5-mil PET film with hard coat (HC) on the backside; 2) 7-mil PC film without HC on back side.

The grades of AgNW films that are used for making AgeNT-30 product structures are **CHASM-AGENT-AW310** (5-mil PET film substrate) or **CHASM-AGENT-AW321** (7-mil PC film substrate). 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.



AgeNT-30



+

PE Release Liner
30 Ω/□ AgNW coating
5 mil PET film
Hardcoat

AW310

AgeNT-30



+

PE Release Liner
30 Ω/□ AgNW coating
7 mil PC film
PE Release Liner

AW321

Flexible printed circuit (FPC) patterns are created by: 1) screen printing CNT ink on top of the AgNW film; 2) hot air drying at ~ 100°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).

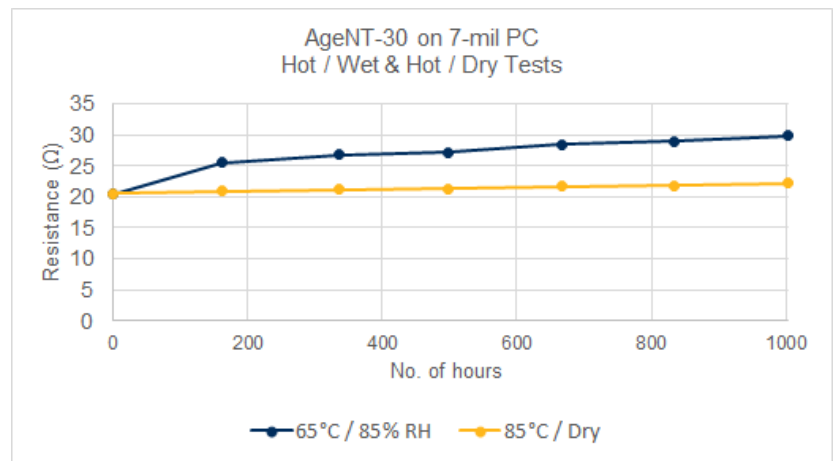
### Optoelectronic Properties\*

	AgeNT-30 on 5-mil PET	
	TCF + Substrate	TCF Only
Sheet Resistance ( $\Omega/\square$ )	30	30
VLT (%)	87.8%	95.8%
Haze (%)	2.0%	1.0%
L*	94.38	-
a*	-0.71	-
b*	2.57	-

	AgeNT-30 on 7-mil PC	
	TCF + Substrate	TCF Only
Sheet Resistance ( $\Omega/\square$ )	30	30
VLT (%)	87.1%	94.8%
Haze (%)	1.5%	1.0%
L*	94.10	-
a*	-0.73	-
b*	1.98	-

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

### Environmental Stability



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

#### 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.

Several patents issued & pending. AgeNT, the AgeNT logo, CHASM, the CHASM logo, CoMoCAT and V2V are trademarks of CHASM Advanced Materials, Inc. Copyright © 2020 CHASM Advanced Materials, Inc., all rights reserved

### Let us help you!

The material scientists and engineers at CHASM's Application Development Center are available to help you integrate AgeNT into your application. Email [sales@chasmtek](mailto:sales@chasmtek) to request additional information.

