



ADCNT-LLDPE MB
ELECTRICALLY CONDUCTIVE
CARBON NANOTUBES-
LLDPEPP MASTERBATCH

Electrically Conductive Carbon Nanotubes - LLDPE Masterbatch

1. Product identification

- Product name: **LLDPE MASTERBATCH**
- Polymer matrix: **Linear low density polyethylene (LLDPE)**
- Conductive additive: **Customized carbon nanotubes (CNT)**
- Carbon nanotube loading: **20% ± 1 wt%**
- Physical form: **Black pellets**



2. Product description

ADCNT-LLDPE MB is a highly filled conductive masterbatch based on LLDPE containing 20% Customized carbon nanotubes. It is designed to provide permanent ESD and electrical conductivity to LLDPE films and flexible parts at low masterbatch additions, allowing you to tune resistivity from insulation to highly conductive by adjusting CNT loading.



3. Typical properties (masterbatch)

Property	Test method	Value
Color	Visual	Black
Occurrence	Visual	Black pellets
CNT loading	–	20% ± 1 wt%
Real density	ISO 1183	588 g/L
MFI (190 °C / 2.16 kg)	ASTM D1238	Not measurable (very low flow)

4. Electrical properties after dilution in LLDPE

4.1 Appearance and flow after dilution of 20% MB to different wt.% of CNT.

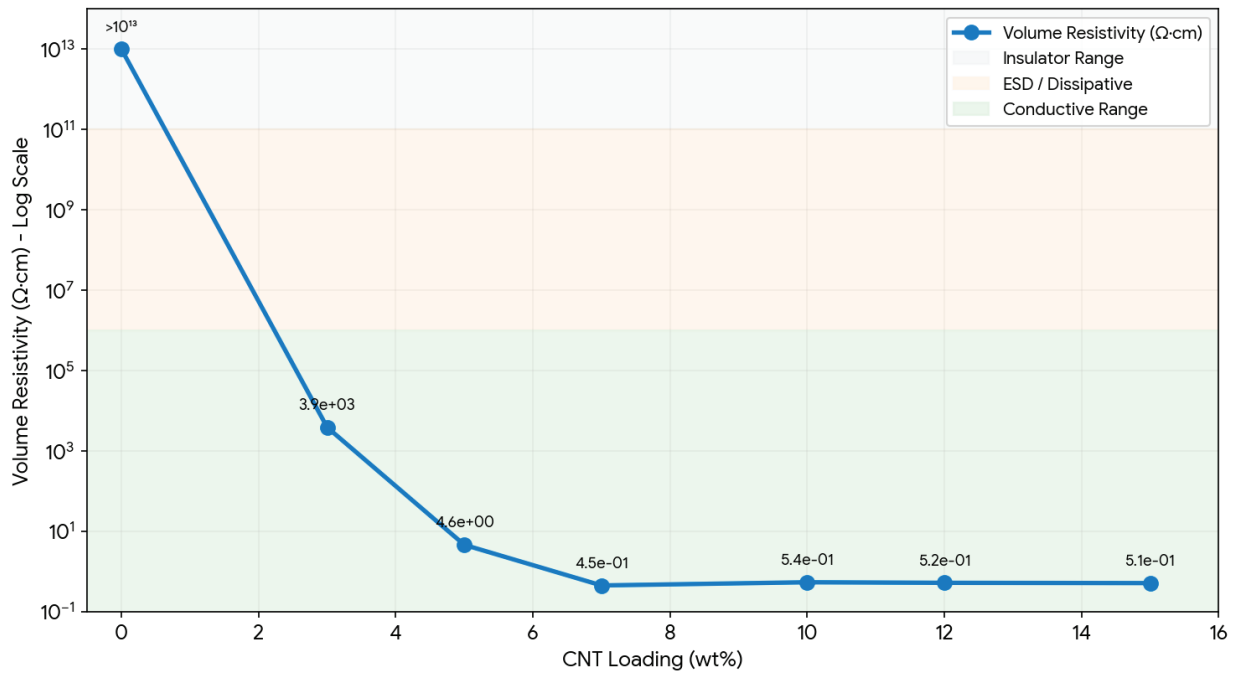
Property	Test method	Neat LLDPE	3% CNT	5% CNT	7% CNT	10% CNT	12% CNT	15% CNT
Color	Visual	White	Black	Black	Black	Black	Black	Black
Occurrence	Visual	White pellets	Black pellets	Black pellets	Black pellets	Black pellets	Black pellets	Black pellets
MFI (190 °C / 2.16 kg, g/10 min)	ASTM D1238	50	~17	~7	~2	NM	NM	NM

("NM" = not measurable)

4.2 Volume resistivity vs CNT loading

Cnt in LLDPE (Wt%)	Volume Resistivity ($\Omega \cdot \text{cm}$)
0	$>10^{13} \Omega \cdot \text{cm}$
3%	$3.86 \times 10^3 \Omega \cdot \text{cm}$
5%	$4.59 \Omega \cdot \text{cm}$
7%	$0.44 \Omega \cdot \text{cm}$
10%	$0.53 \Omega \cdot \text{cm}$
13%	$0.52 \Omega \cdot \text{cm}$
15%	$0.51 \Omega \cdot \text{cm}$

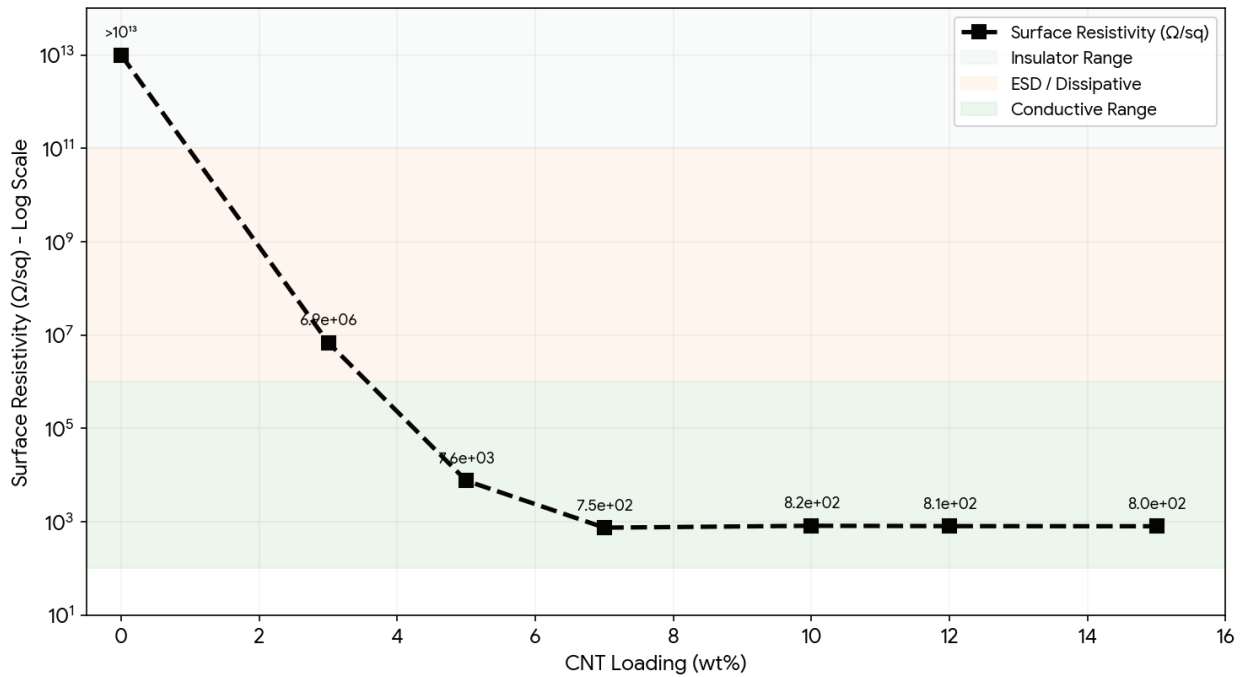
LLDPE Volume Resistivity Percolation Curve



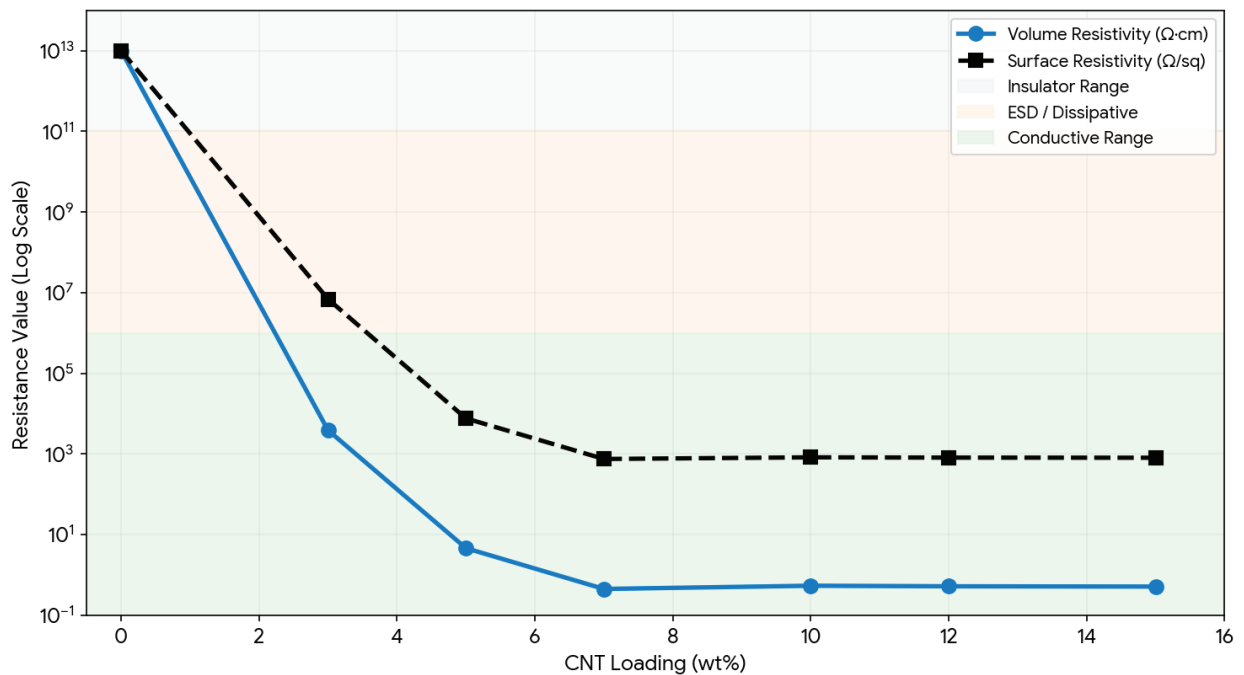
4.3 Surface resistivity vs CNT loading

CNT in LLDPE (wt%)	Surface Resistivity (Ω/sq)	Approx. Surface Resistivity Band
0	>10 ¹³ Ω/sq	Insulator
3	6.91 × 10 ⁶ Ω/sq	~10 ⁷
5	7.60 × 10 ³ Ω/sq	~10 ⁴
7	7.50 × 10 ² Ω/sq	~10 ³
10	8.23 × 10 ² Ω/sq	~10 ³
12	8.10 × 10 ² Ω/sq	~10 ³
15	8.04 × 10 ² Ω/sq	~10 ³

LLDPE Surface Resistivity Percolation Curve



Electrical Efficiency: Volume vs. Surface Resistance (LLDPE-CNT)



- **Rapid Percolation:** LLDPE hits the conductive regime much faster than other polymers; at just 3% loading, volume resistivity is already down to 3.86×10^3 ohm.cm
- **The 5% Collapse:** At 5% loading, bulk resistivity collapses entirely to 4.59 ohm.cm, putting it deep into the green conductive zone.

- **Extreme Conductivity:** At 7% to 15% loading, the volume resistivity drops below 1 ohm.cm (0.44 to 0.51), which is high-performance level for EMI shielding.
- **Surface Stability:** Surface resistivity stabilizes at 7% loading (7.50×10^2 ohm/sq) and remains almost unchanged up to 15% loading.
- **Saturation Point:** The flat curve between 7% and 15% shows that the LLDPE-CNT network is fully saturated; adding more than 7% CNT does not significantly improve conductivity.

5. Recommended applications (LLDPE + CNT)

CNT in LLDPE (wt%)	Surface Resistivity Band (Ω /sq)	Typical LLDPE Applications
~3%	$\sim 10^7 \Omega$ /sq	ESD bags, ESD bubble wrap, antistatic liners.
~5%	$\sim 10^4 \Omega$ /sq	Conductive drum liners, FIBC liners, pallet covers.
7-10%	$\sim 10^3 \Omega$ /sq	ESD / conductive stretch wrap, shrink film.
10-15%	$< 10^3 \Omega$ /sq	Highly conductive film, conductive sleeves/tubes.

6. Processing guidelines (LLDPE + CNT MB)

- **Drying:**
 - Typically, not required for LLDPE, but if pellets have absorbed moisture, dry at 50–70 °C before high precision SR testing.
- **Processing temperature:**
 - Melt temperature: 180–230 °C for extrusion / film blowing, depending on base LLDPE grade.
- **Shear and mix:**
 - Use standard LLDPE film blowing or cast film screws.
 - Moderate screw speed: avoid extreme shear peaks that can shorten CNTs and slightly reduce conductivity.
 - Ensure good premix of MB and base LLDPE (tumbler or gravimetric feeder) for uniform ESD.

7. Storage and handling

- Store ADCNT-LLDPE MB in its original, closed packaging in a cool, dry place, away from UV and heat.
- Re-seal open bags; re-dry material if exposed to moisture for long periods.
- Handle pellets to minimize dust; follow CNT-related SDS guidance.

8. Filler content in MB vs in polymer (LLDPE)

Our CNT-LLDPE MB:

- MB CNT loading: 20 ± 1 wt% in LLDPE.
- Final CNT in LLDPE = (MB dosage in LLDPE) \times 0.20.

Target Surface Resistivity band	Target CNT in LLDPE (wt%)	Required CNT LLDPE MB (wt%) loading in LLDPE
$\sim 10^7 \Omega/\text{sq}$ (ESD)	3%	$\sim 15\%$ of MB
$\sim 10^4 \Omega/\text{sq}$ (conductive)	5%	$\sim 25\%$ of MB
$\sim 10^3 \Omega/\text{sq}$ (conductive / EMI-assist)	7%	$\sim 35\%$ of MB
$< 10^3 \Omega/\text{sq}$ (Highly conductive)	$\sim 10\%$	$\sim 50\%$ of MB

Disclaimer

The values are typical and are for very general guidance and must not be used as a basis for specifications as concrete. Information contained in this publication, and otherwise supplied to users, is based on our general experience and is given in good faith, but we are unable to accept responsibility in respect of factors which are outside our knowledge or control. No warranty, either expressed or implied, is hereby made. The recommended industrial hygiene and safe handling procedures are believed to be generally applicable. Please refer to MSDS of respective products for safe use.

Contact us

Adnano Technologies Pvt Ltd

Address

Plot No 62/P D Ward No 35,
1st Cross Machenahalli Industrial
Area Bhadravati
Shivamogga - 577222
Karnataka, India

Tel: +91-8296734214

Email: info@ad-nanotech.com

Web: www.ad-nanotech.com