Transparent Conductive Materials based on Silver Nanowires and Nanocelluloses: Physics and Applications

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Introduction

Transparent Conductive Materials
- Indium tin oxide: most efficient and widely used but brittle and scarce
- Emerging materials: graphene, carbon nanotubes, metallic nanowire networks, conductive polymers...

Silver nanowires, a good alternative to indium tin oxide
- Excellent opto-electrical properties and high flexibility
- Electrical, thermal and mechanical stability issues

Nanocellulose, an efficient renewable material for electronics
- Use in formulation with conductive particles
- Use as substrate

Objectives

Development of a Transparent Conductive Material based on ZnO/AgNW/CNF nanocomposites

Efficient
High transmittance (90%) and low sheet resistance (10 Ω/sq)

Stable
Thermal and electrical stability

Low-cost and integrable within devices

Applications
Transparent conductive materials are the key components of:
- Solar cells
- Flexible light-emitting devices
- Touch screens
- Transparent heaters

Methods

Spray-coating
- Deposition of AgNW and CNF coatings
- Substrate (glass, PET, PEN)

Atmospheric Pressure Spatial Atomic Layer Deposition
Coating of a thin conformal ZnO layer

Characterizations
- Morphological and optical characterizations (Spectrophotometer, SEM, TEM, EDS, XPS)
- Thermal and electrical stability studies
- Bending test

FunPrint

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Matériaux transparents et conducteurs à base de nanofils d’argent et de nanocelluloses : de la physique fondamentale aux applications