

A room temperature method for producing noble-metal coated copper nanowires that maintains the optoelectronic properties of noble-metal wire at a lower cost

Unmet Need

Transparent conductors are necessary components for smartphones, organic photovoltaics (OPVs), organic light emitting diodes (OLEDs), flat panel displays, and touch sensors. Indium tin oxide (ITO) is the chief material utilized for this purpose due its low sheet resistance at high transmittance values. However, indium is a scarce and expensive starting material, and the brittle ceramic nature limits its use in flexible applications. Additionally, the vapor phase sputtering process required to fabricate ITO electrodes results in higher final costs. Silver nanowires are an emerging promising alternative to ITOs but is still a limiting option due to scarcity and cost of silver. There is a need for an ITO alternative that can be coated from solution without compromising optoelectronic performance.

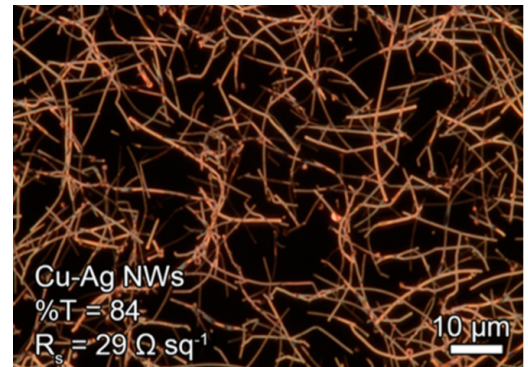
Technology

Inventors at Duke have developed a process for producing noble-metal coated copper nanowires intended for use in transparent conducting films. Specifically, this is a room-temperature solution-phase process in which ascorbic acid is used to remove the passivating copper oxide coating from the copper nanowires and reduce the noble metal ions onto the surface. The copper-silver nanowire demonstrated improved resistance to oxidation compared to uncoated copper nanowire and maintained optoelectronic properties compared to silver nanowire. The inventors further demonstrated that copper-gold and copper-platinum core-shell nanowires could be produced.

Advantages

- Confers oxidation resistance and conductivity to copper nanowires immediately after printing with no postprocessing
- A cheaper indium tin oxide film alternative due to the use of solution phase coating
- Maintains optoelectronic properties equivalent to silver

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Links

- [From the lab of Dr. Benjamin Wiley](#)

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nanowire films but requires less silver to achieve

Publications

- [Synthesis of Cu-Ag, Cu-Au, and Cu-Pt Core-Shell Nanowires and Their Use in Transparent Conducting Films \(Chemistry of Materials, 2015\)](#)
- [Issued US Patent 10,354,773](#)
- [Multigram Synthesis of Cu-Ag Core-Shell Nanowires Enables the Production of a Highly Conductive Polymer Filament for 3D Printing Electronics \(Particle, 2018\)](#)

Patents

Patent Number: 10,354,773

Title: NOBLE METAL-COATED NANOSTRUCTURES AND RELATED METHODS

Country: United States of America