Breakthrough Research Leads to Ultra-Conductive Copper

Study: Future for Super Conductors and Ultra-Conductive Copper

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Up to now, notable advancements in increasing the conductivity of copper have been few and far between, but new research commissioned and directed by the International Copper Association (ICA) shows that combining copper with graphene can produce ultra-conductive copper (UCC). This new material has an electrical conductivity 16% higher than that of copper at room temperature and could prove a transformative advancement for the industry.

Key Findings:

- ICA funded and directed research led to the discovery of UCC, which has an electrical conductivity 16% higher than that of copper at room temperature.
- Further improvements in electrical conductivity using this technique are possible.
- This new material promises a significant impact across all electrical applications.

Breakthrough Research

The research—seeking a new method for increasing copper conductivity by combining copper with graphene—has led to a verified breakthrough with the potential to be game-changing technology for the industry:

- The electrical conductivity of commercial copper wire is measured according to the International Annealed Copper Standard (IACS), with 100% IACS established at room temperature.
- The purest copper (99.99999% purity) only reaches 103% IACS.
- The copper/graphene nanocomposite—consisting of alternating layers of graphene and copper—demonstrated 116% IACS conductivity at room temperature; 16% higher than that of commercial copper wire at room temperature.

Real World Applications

This breakthrough is critical for the copper industry and far beyond, given 60% of total copper usage is in wire and cable electrical conductivity applications.

Improved UCC conductors could offer:

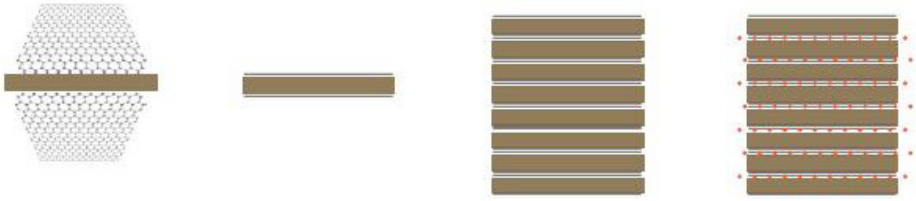
- Lower resistance
- High ampacity
- Lighter weight
- Smaller size
- Insensitivity to temperature

UCC technology could be used in all electrical applications, including:

- Data cable
- Magnet wires in motor stators
- Copper foil in batteries
- Circuit boards
- Bonding wire for lead frame to chip
- Chip-level connections
- Power transmission cable
- Power cable

How it Works

- Graphene is applied to both sides of copper foil so that the copper is sandwiched by graphene (see below).
- A stack of copper and graphene layers are pressed together, creating electron-path channels (see below).
- Experimental results show a dramatic increase in bulk electrical conductivity with six layers.
- Conductivity of the channels has been measured at 100 times the conductivity of copper.
- Other production methods are possible.



Apply graphene to copper foil... | Sandwich copper with graphene | Stack and press Layers | Creating electron path channels

For more information on copper demand or ICA, visit www.copperalliance.org. For more information on copper's use in sustainable energy, visit www.sustainablecopper.org.

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