



## NCORE™ Current Collectors

Ultra-thin, metal-polymer composite current collectors for lighter, safer batteries.

Functioning as a smart fuse, NCORE™ prevents additional inrush current from triggering a thermal runaway that can potentially lead to a dangerous fire that is extremely difficult to extinguish in a cell when its internal temperature exceeds 250°C. Eliminating up to 90% of the copper contained in a typical current collector, NCORE™ reduces the weight of the battery and improves its performance and recyclability. Traditional current collectors are bulky and heavy which reduces the gravimetric energy and power density achievable in a Li-Ion battery. Replacing metallic foils with a metal/polymer composite has several key advantages including making batteries lighter, safer, and more sustainable. NCORE™ is fabricated by coating a 6- $\mu\text{m}$ -thick polymer substrate with a thin (250 nm) layer of copper metal on each side. High-density Cu elements (bridges) are also embedded within the substrate in this metallization process. The resulting material exhibits increased conductivity in both in-plane and out-of-plane directions.

## BENEFITS



**DRAMATIC WEIGHT  
REDUCTION OF THE  
CURRENT COLLECTOR**  
(-90% FOR THE COPPER  
FOIL)

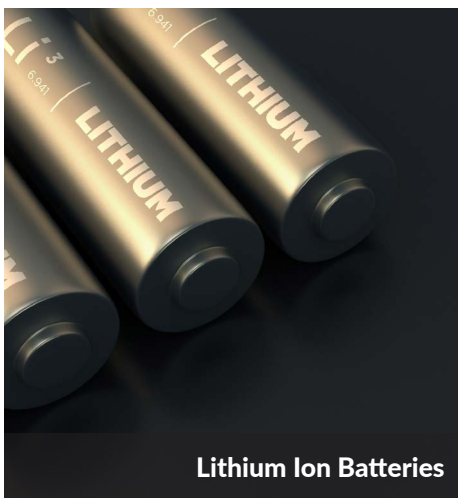


**IMPROVED SAFETY  
AGAINST THERMAL  
RUNAWAY VIA FUSE-  
LIKE FEATURE**

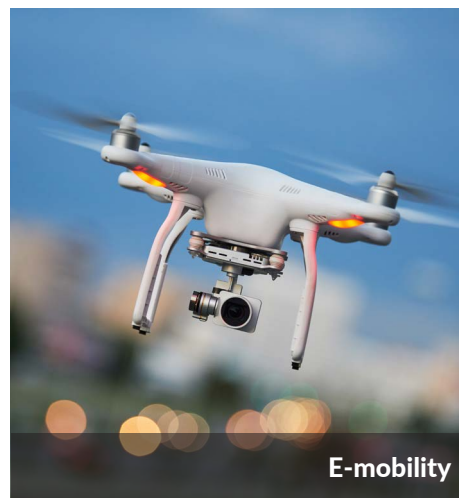


**ENVIRONMENTALLY  
FRIENDLY, SUSTAINABLE  
ALTERNATIVE WITH  
REDUCED RELIANCE ON  
METAL MINING**

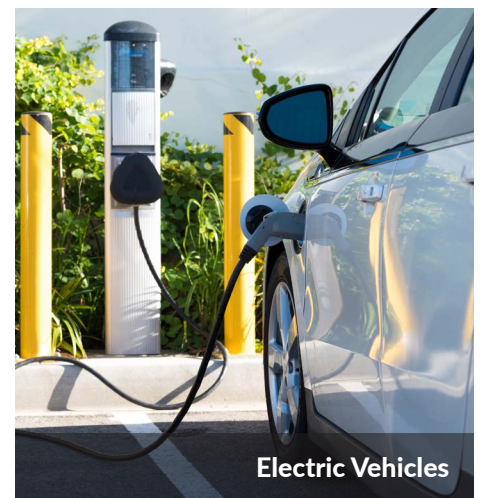
## APPLICATIONS



Lithium Ion Batteries



E-mobility



Electric Vehicles

# SPECIFICATIONS

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## Reduced weight

-90% weight reduction compared to copper foil  
-5% weight reduction at cell level

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## Electrical properties

3X higher conductivity compared to commercial metallized plastic

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## Physical properties

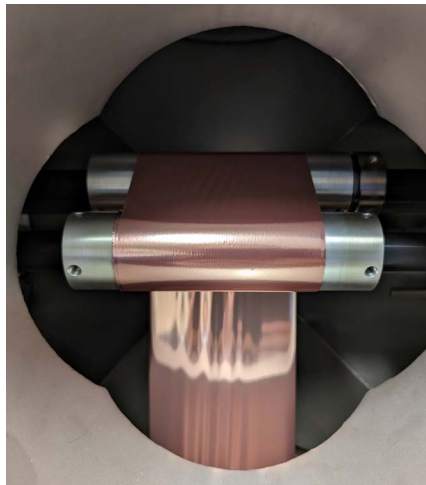
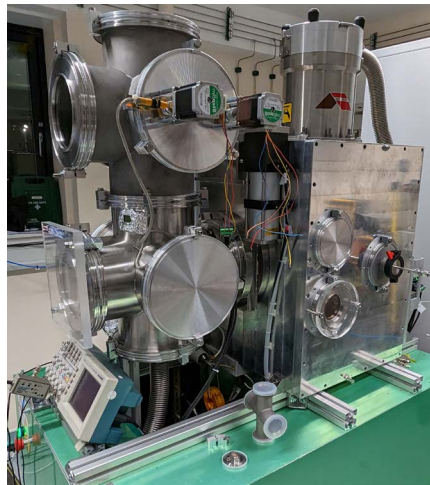
Multiple times higher Elongation To Break (ETB) compared to Copper foil  
Ultra-high adhesion between metal and polymer matrix  
Ultra-thin, <math><6.5 \mu\text{m}</math> total thickness  
Stable up to >200° C

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## Battery Cell Improvements

Reduced cell weight (~5%)  
Increased capacity for energy density (>10% specific energy density)  
Improved safety via fuse-like feature

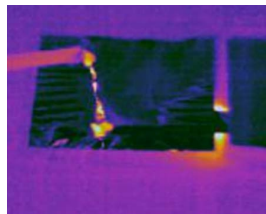
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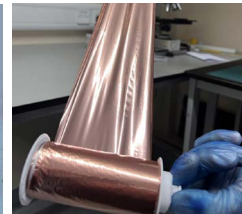
Roll-to-roll system



NCORE™ current collector



Fuse-like feature



Sample roll output



PLASMAfusion® in action