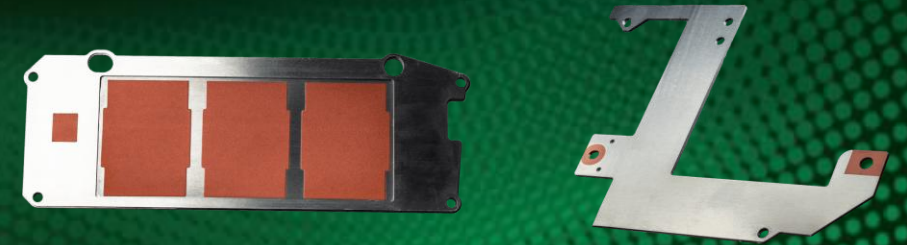


Advanced cooling of power electronics with copper cold sprayed aluminum heatsinks & busbars



Impact Innovations GmbH

LEADING HARDWARE SUPPLIER FOR
INDUSTRIAL COLD SPRAY TECHNOLOGY.

Impact Innovations GmbH

- 20+ years of Cold Spray expertise
- Global technology leader in high-pressure Cold Spray systems for industrial use
- In-house R&D and application development at our headquarters in Germany
- Proven Cold Spray solutions for coating, repair, and additive manufacturing
- 50+ dedicated employees based in Rattenkirchen, Bavaria
- Worldwide sales and service network supporting global customers



Impact Innovations Footprint

Broad industry coverage

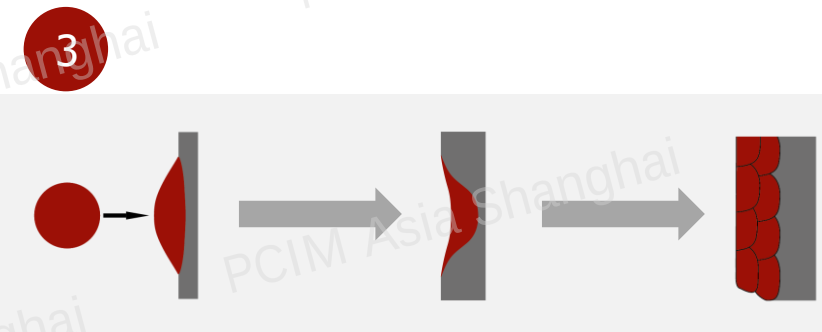
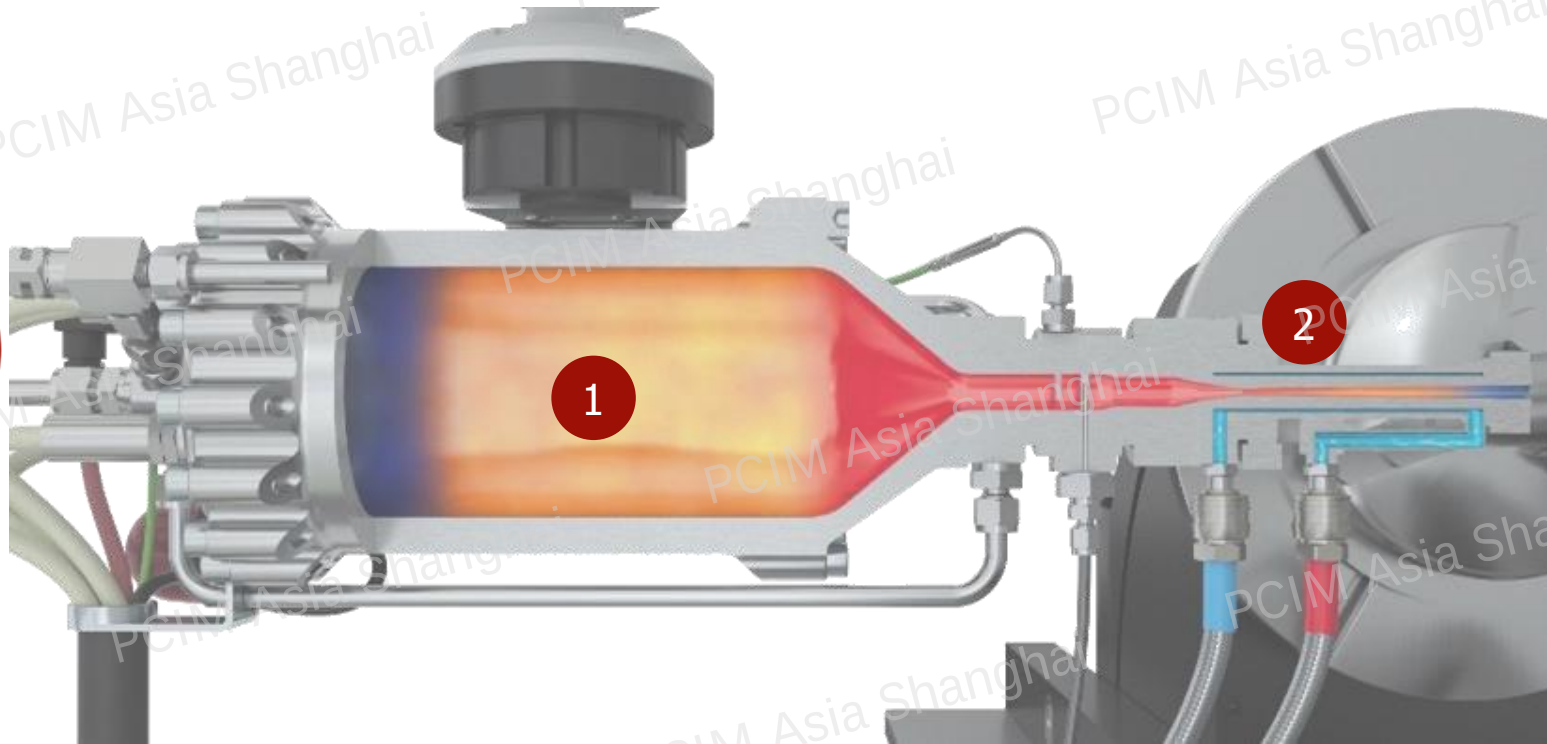
Automotive	Aerospace	Aviation
Consumer	Defense	Energy
Research	Coating Services	Electrics

100+ installed systems internationally



Cold Spray Technology to coat, repair & manufacture components

COLD SPRAYING IS A **SOLID-STATE PROCESS** THAT USES **KINETIC ENERGY** TO APPLY METALLIC POWDER, **AVOIDING THERMAL STRESS** AND PRESERVING THE ORIGINAL MATERIAL PROPERTIES



1 A process gas, typically nitrogen or helium is heated to temperatures of up to 1.100 °C

2 Powder is propelled to particle speeds of up to 1.200 m/s in the gas stream

3 Upon impact, the highly focused spray jet causes particles to deform and adhere, creating a robust and cohesive surface

impact

We focus on kinetic energy to enable a solid-state process

HOW IT WORKS – FROM PARTICLE ACCELERATION TO STRONG, DENSE COATINGS



A close-up photograph of a hybrid heatsink and busbar assembly. The central feature is a circular busbar with a smaller concentric circle in the middle, all with a metallic, slightly textured appearance. This is surrounded by a larger, more complex heatsink structure with various curved and flat surfaces. The background is dark and out of focus.

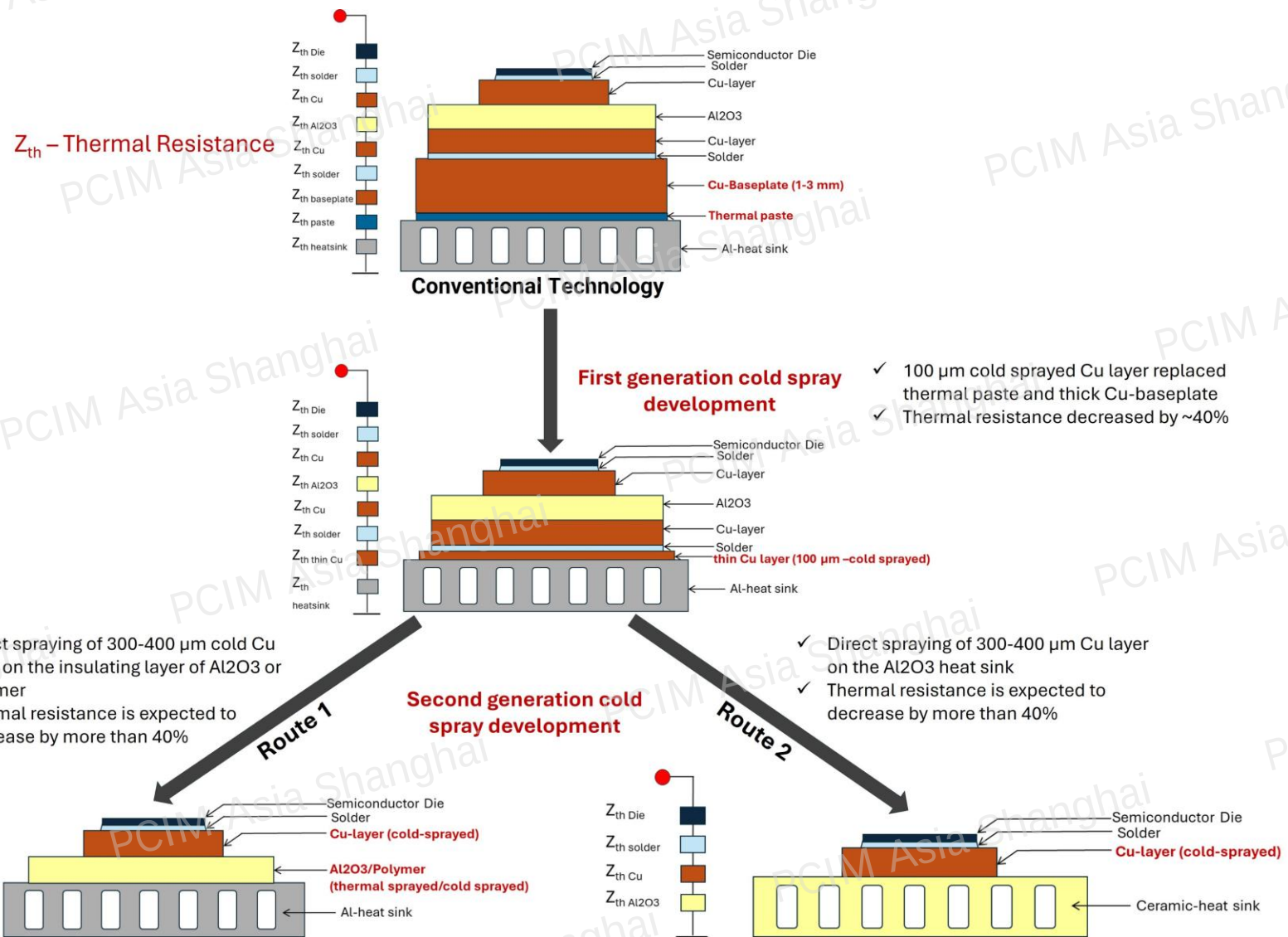
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Hybrid heatsinks & BUSBARS

Chapter 1:

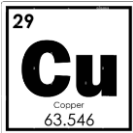
**Aluminium heatsinks & Busbars with
Solderable copper coating**

impact Performance, simplicity, cost efficiency

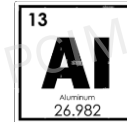


impact First generation of cold sprayed hybrid heatsinks

SOLDERABILITY, COST EFFICIENCY, PERFORMANCE



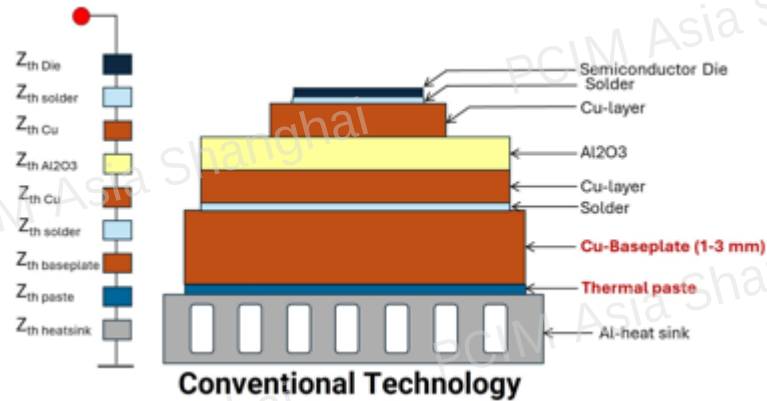
- ✓ Solderable
- ✓ Sinterable
- ✓ Highly conductive



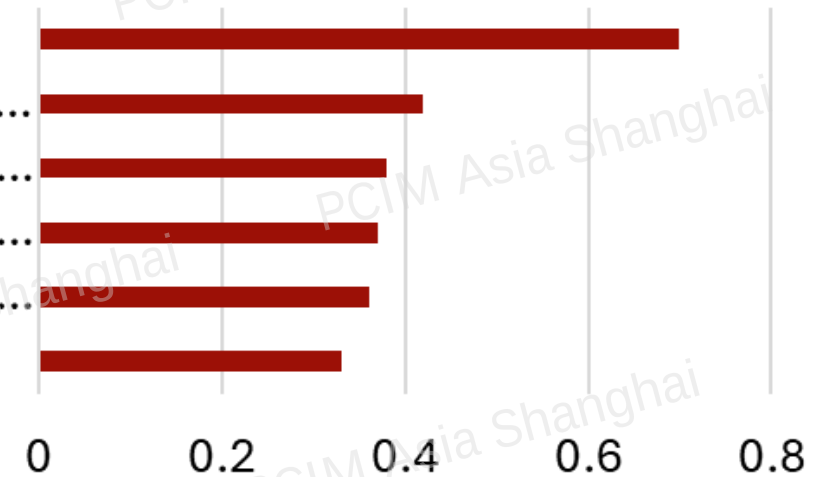
- ✓ Light weight
- ✓ Easy sourcing
- ✓ Uniform cooling circuit



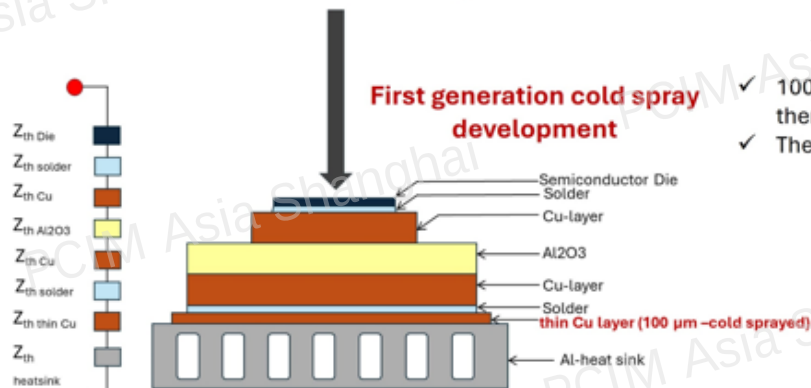
impact 1st stage – substitute the thermal paste with solder paste



TIM + Al 5 mm
Solder paste + Cu 0,3 mm...
Solder paste + Cu 2 mm...
Solder paste + Cu 3 mm...
Solder paste + Cu 5 mm...
Solder paste + Cu 5 mm

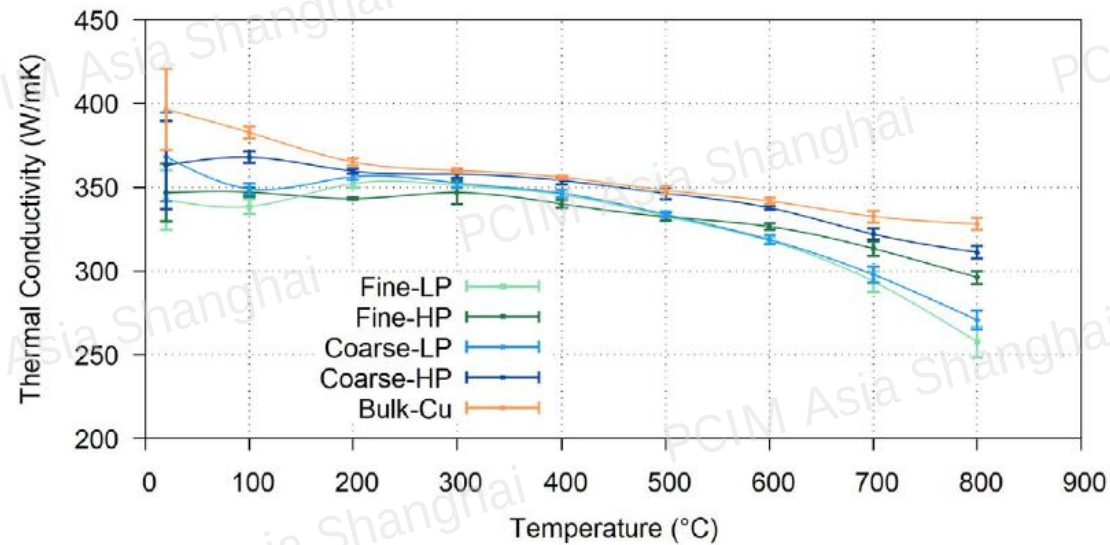


■ Thermal resistance in K / W



- ✓ 100 µm cold sprayed Cu layer replaced thermal paste and thick Cu-baseplate
- ✓ Thermal resistance decreased by ~40%

impact Ready for High-Volume Production



Overall flatness

Tolerance

-40 / + 100 μm

Bonding

➤ 60 Mpa

➤ Copper purity up to 99,5%

impact Ready for High-Volume Production

IMPACT TURNKEY SYSTEMS DELIVER RELIABLE, EFFICIENT COLD SPRAY PERFORMANCE – BUILT FOR SEAMLESS, ECONOMICAL PRODUCTION WHERE EVERY DETAIL DRIVES SUCCESS

TURNKEY SOLUTIONS

- Homogenous coatings in under 15 seconds
- Highly solderable / sinterable
- Physical properties close to bulk material
- IACS up to 95%
- Thermal conductivity up to 368 W/mK



Automotive

Liquid-Cooled Inverter Heatsink



Trusted by

BOYD

VZU
PLZEN

ENPACT
& others

Impact Innovation's solution(s)

- Selective copper coating on aluminium components
- Solderable copper coatings on aluminium heatsinks
- Solderable copper coatings on non-metal substrates (e.g. Peek, strong polymers)



Success factors

Material efficiency: Less copper, lower weight, reduced material costs

Superior Performance: Outstanding thermal and electrical conductivity

Lightweight design: Ideal for mobility and energy systems

Sustainable process: No melting, minimal waste, eco-friendly

Production Scalability: Flexible, high-volume manufacturing for automotive needs

Automotive Busbar



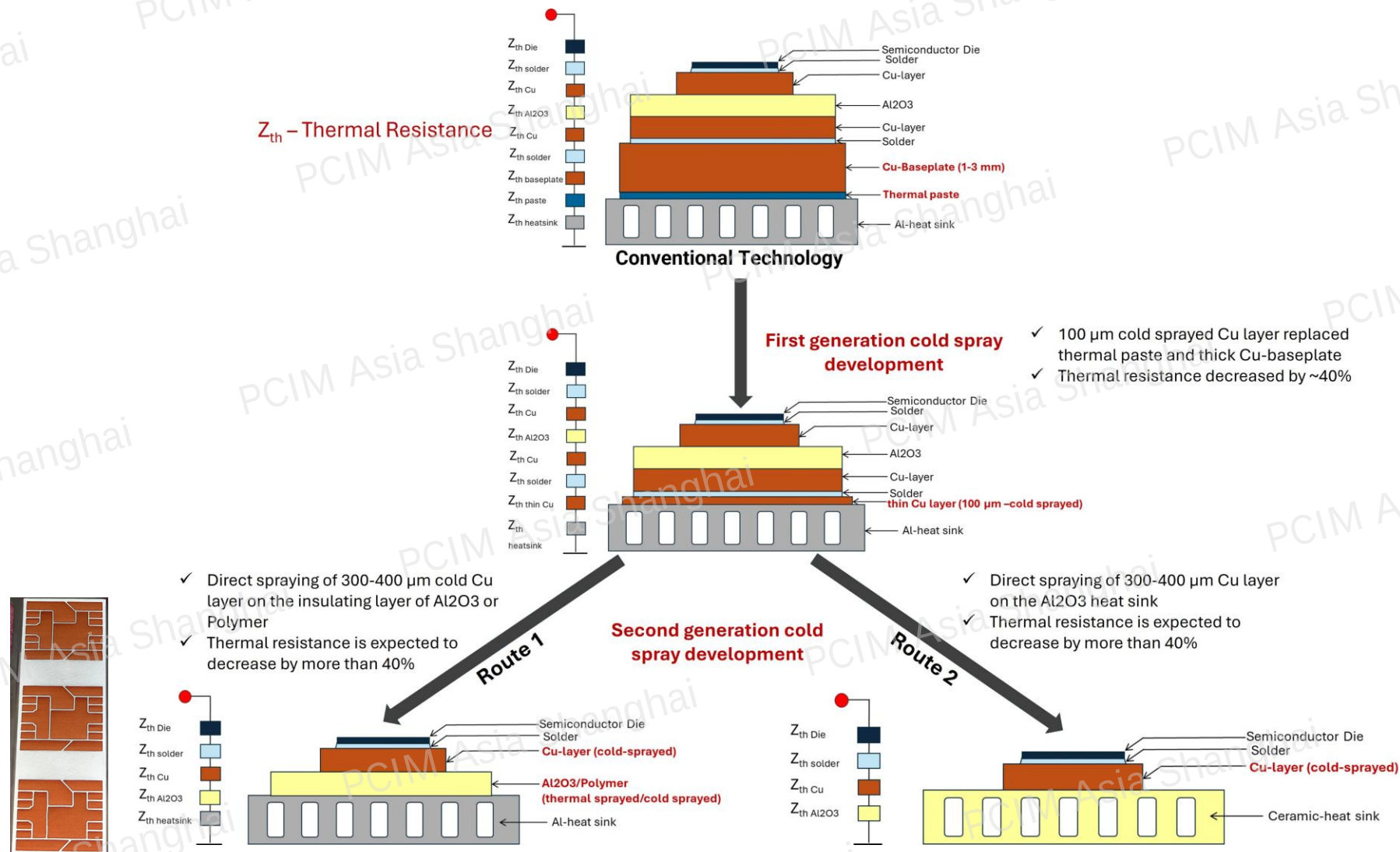
A close-up photograph of a hybrid heatsink, showing a central circular copper-coated ceramic layer surrounded by a metallic base. The image is used as a background for the title and subtitle.

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Hybrid heatsinks route 1

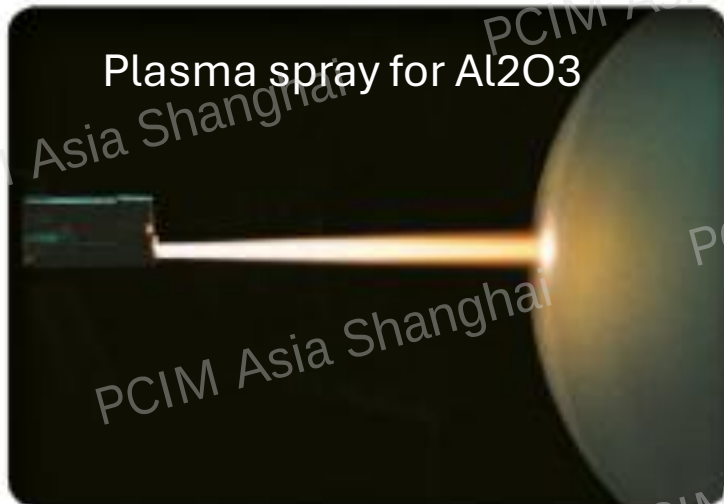
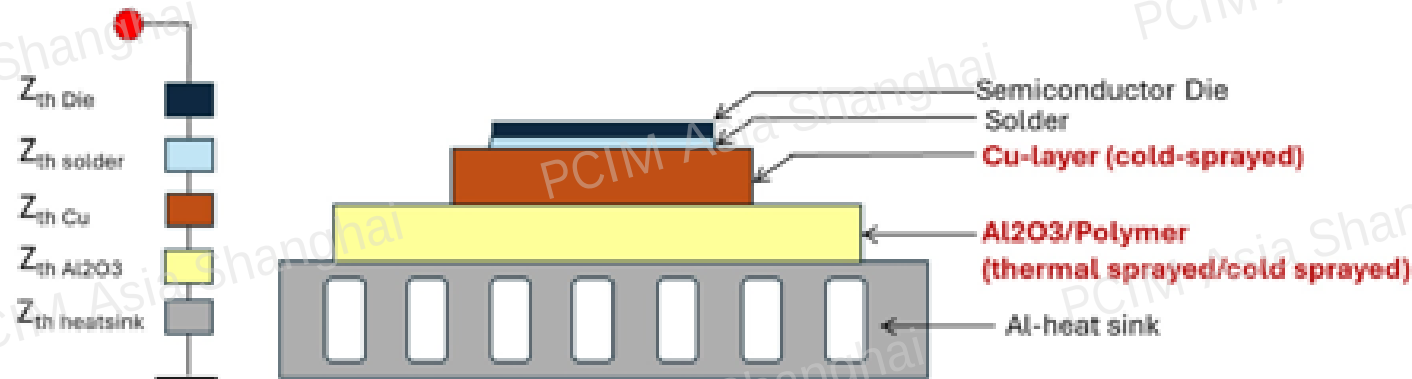
Copper coating on ceramic layers

impact Route 1, eliminating layers



impact Al₂O₃ (Plasma Spray) + Cu (Cold Spray)

SCHAEFFLER
Project 2025 with Vitesco Technologies Germany GmbH



- 200-500 μm Al₂O₃ and Cu-coating are feasible to deposit
- Further development for industrial scale is ongoing

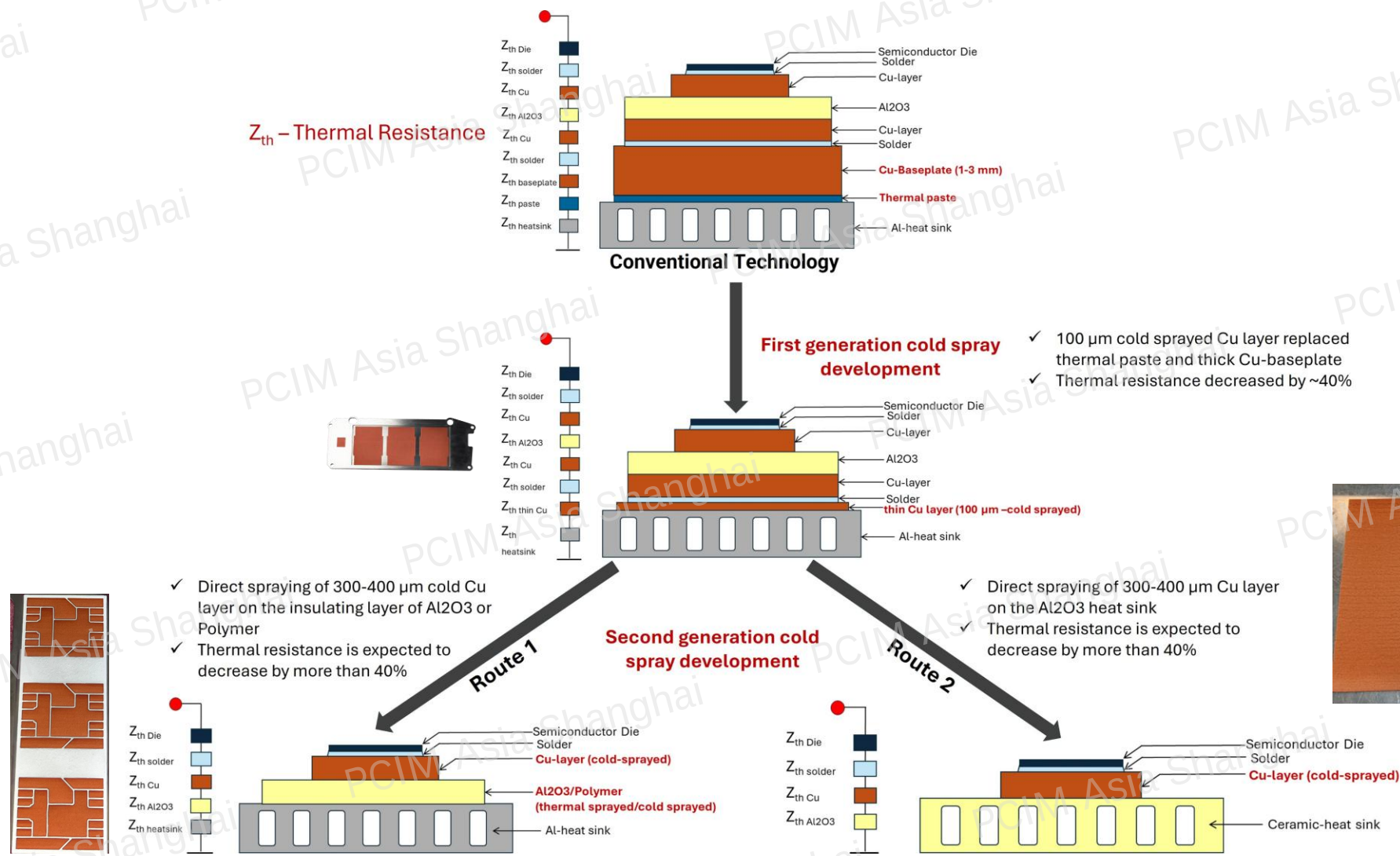


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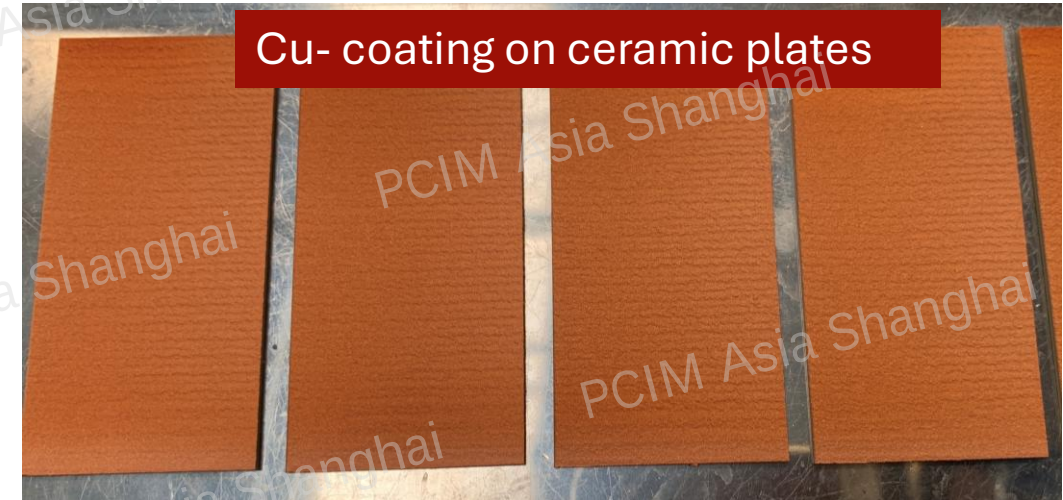
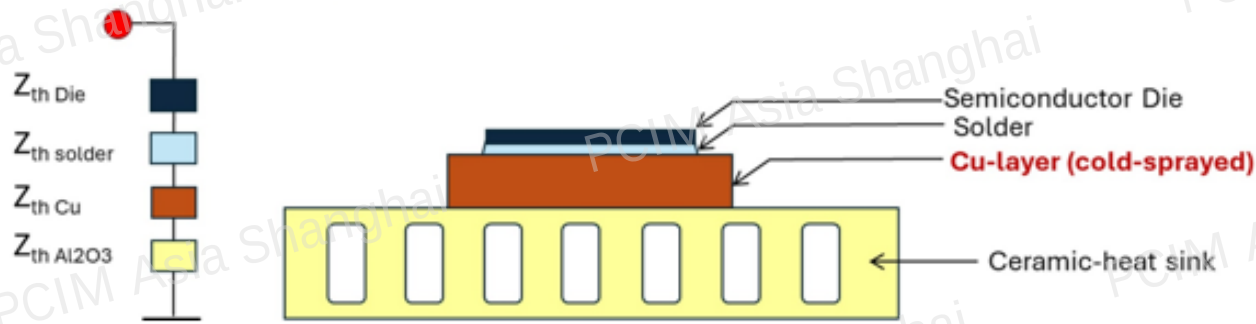
Hybrid heatsinks 2nd stage

Copper coating on ceramic heatsinks

impact Options:



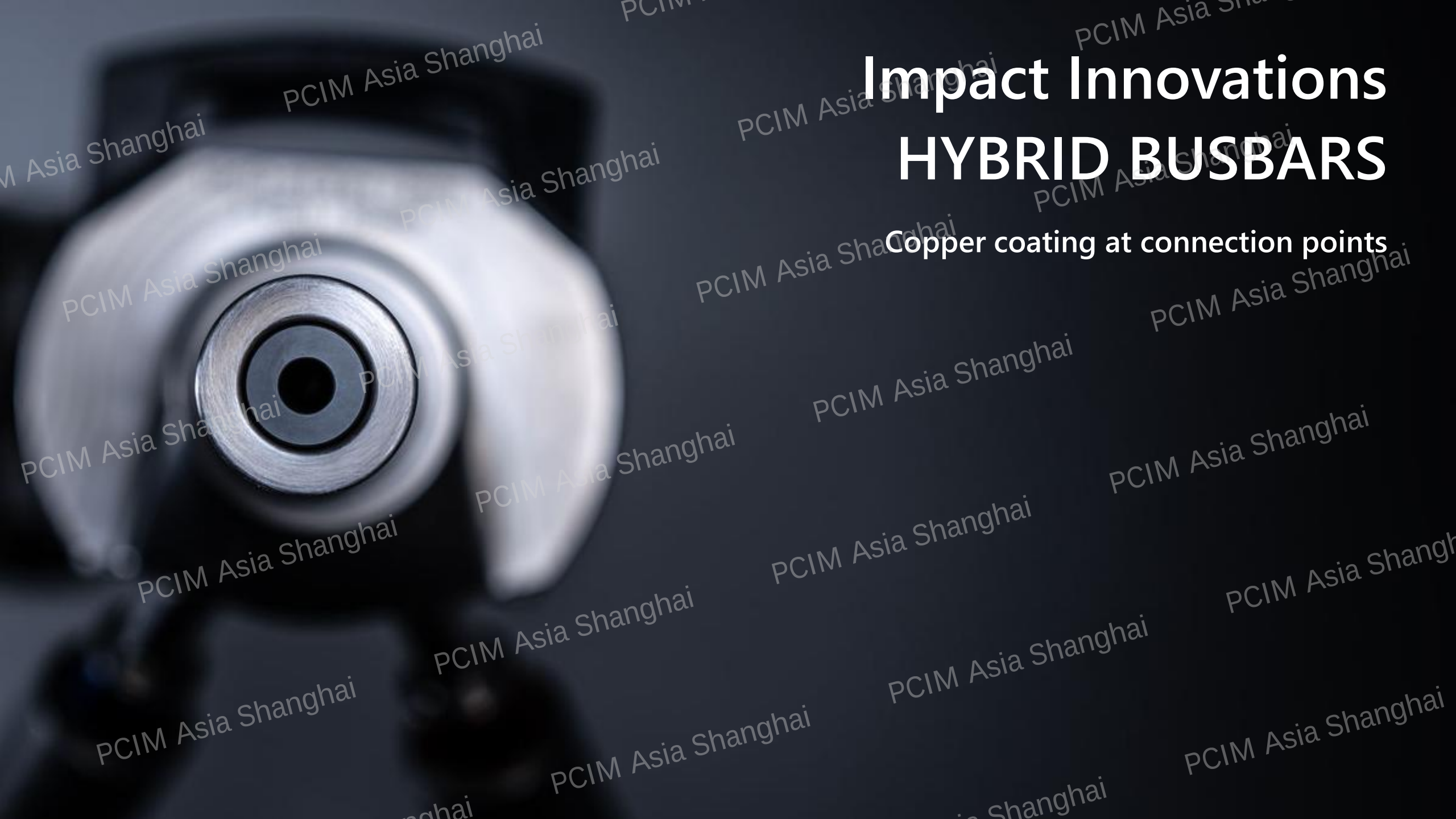
impact Cu on ceramic heatsink



Cu- coating on ceramic coolers



- No surface preparation and bond coat
- 200-500 μm Cu-coating is feasible to deposit
- Further development for industrial scale is ongoing



Impact Innovations HYBRID BUSBARS

Copper coating at connection points

Energy



Impact Innovation's solution(s)

- Cold Spray coatings on aluminum busbars and conductors
- Electrically conductive coatings on CFRP substrates (e.g. Cu, Ag, Ni)



Trusted by



Success factors

Highest Performance by low cost: Replace solid copper with functional Cu coatings on Aluminum to save cost and weight

Electrical Performance: High-conductivity coatings for efficient current transfer

Production Flexibility: Mask-free process, adjustable coating thickness and spot width

Advanced Integration: Enables conductive surfaces on non-metallic parts (e.g. CFRP)

Scalable Output: Suitable for industrial-scale production with minimal material waste



Close collaboration with customers and partners

**BMW
GROUP**



DERNS
Thermo Tech

VEKAN

BOYD

ASC

Australia's
Submarine
Company

Schneider
Electric



INSA INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
LYON



POLITECNICO
MILANO 1863

CROMOMED S.A.

FST Flame Spray Technologies

ENPACT



Any Questions?



INNOVATION STARTS WITH CURIOSITY – AND GREAT CONVERSATIONS.

Whether you have questions, ideas, or bold visions – we're here for it.

Let's talk about your challenges, explore possibilities, and create impact – together.





We. Spray. Future.

THANK YOU!

LET'S SPRAY THE FUTURE TOGETHER.

Michael Dasch
International sales
md@impact-innovations.com

