FUSION FOR ENERGY

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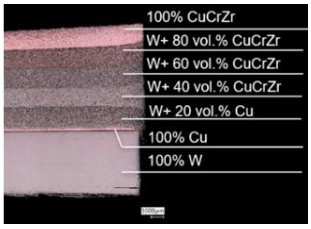
Graded Tungsten Copper (GTC) for Thermal Management Applications

Developed by RHP Technology within the Fusion for Energy (F4E) Technology Development Programme for ITER applications, the GTC technology enables the manufacturing of multilayer materials with tailored composition and thermo-mechanical properties. Originally developed to reduce thermal stresses between tungsten and CuCrZr components, the technology offers promising applications beyond fusion, particularly in power electronics and advanced thermal management.

The technology

- A powder metallurgical manufacturing process is combined with predefined powder compositions which are converted into a functionally graded structure.
- Successfully demonstrated for W–CuCrZr joints across the full compositional range from pure tungsten to pure CuCrZr.
- Flexible gradient architecture enabling tailored material properties for specific application requirements.





Left: GTC manufacturing process. Right: Functionally graded W–CuCrZr composite with predefined compositional layers.

Advantages and Potential Applications

- Tailored thermal expansion and thermal conductivity to meet application requirements.
- Reduced thermal expansion mismatch and therfore less thermo-mechanical stresses.
- Metallurgically bonded layers with controlled material transitions.
- Potential applications in fusion components, high power electronics (SiC/GaN modules), packages for harsh environments and advanced thermal management.

Collaboration opportunities

RHP Technology offers GTC material design, prototype manufacturing and characterisation, and welcomes collaborations to adapt the technology to new material combinations and industrial applications.

Fusion for Energy Technology Transfer Programme

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