FUSION FOR ENERGY

TECHNOLOGY OFFER

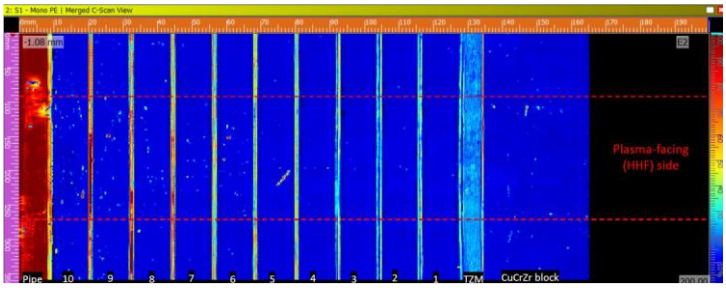


Hot Radial Pressing of Tungsten Monoblock Plasma Facing Components

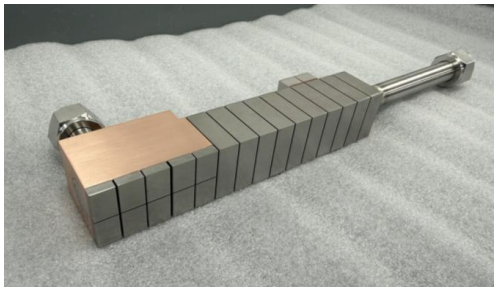
Monoblock plasma-facing components route the cooling water directly through the tungsten armour, demanding a uniform metallurgical bond all around the cooling channel. RTC Engineering, through its collaboration with Fusion for Energy (F4E), operates a Hot Radial Pressing (HRP) process that bonds tungsten monoblocks to a CuCrZr cooling tube under vacuum.

The technology

- Proprietary RTC Hot Radial Pressing system: internal argon pressurization of the CuCrZr tube generates radial compression of the assembly while the part is held under vacuum.



Merged ultrasonic C-scan (pulse-echo) of the copper interlayer / CuCrZr tube interface in the monoblock, acquired after high-heat-flux (HHF) testing at 20 MW/m². Monoblocks 1–10 (plus the TZM ring) are shown along the CuCrZr cooling pipe; the vertical lines mark the inter-block gaps, and the region bounded by the red dashed lines indicates the plasma-facing (HHF) side exposed to the heat load.



Tungsten monoblock string bonded to a CuCrZr cooling tube by Hot Radial Pressing

Advantages and Potential Applications

- Produces actively cooled monoblock components in the geometry used for ITER type divertors.
- Radial pressing delivers a uniform circumferential bond around the cooling channel and is scalable to multi-monoblock strings.
- Backed by UHV cleaning, visual inspection and complete component traceability..

Collaboration opportunities

RTC Engineering offers HRP-based manufacturing of monoblock components and is prepared to produce parts, evaluate the process for new tube/armour material combinations, and collaborate on tailoring the technology to specific high-heat-flux applications.

Fusion for Energy Technology Transfer Programme

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