FUSION FOR ENERGY

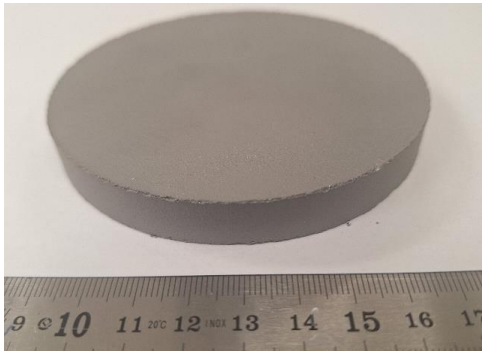
TECHNOLOGY OFFER

Competitive manufacturing of tungsten and tungsten-based components

TECNALIA, in collaboration with Leading Metal-Mechanic Solutions, S.L. and Fusion for Energy (F4E), has successfully developed an advanced, competitive, high-throughput processing route for manufacturing high-density tungsten components using Spark Plasma Sintering (SPS). This innovative process enables the fabrication of tungsten parts with superior mechanical properties, excellent dimensional accuracy, and reduced production times, meeting the demanding requirements of aerospace, and high-performance engineering applications at reduced cost.

The technology

The process is rooted in advanced powder-metallurgy and exploits the unique capabilities of Spark Plasma Sintering (SPS). By passing a pulsed electric current directly through a compacted powder charge, the material is heated resistively while a uniaxial load is simultaneously applied. This combination of rapid, localized heating and controlled pressure enables tungsten particles to reach near-full density (97%), with reduced grain size. Scaling up to 100 mm diameter length was achieved.



Advantages and Potential Applications

This SPS based manufacturing process delivers advantages related to reduced processing time, decreased energy costs, excellent metallurgical quality, and high productivity.

Beyond pure tungsten, the SPS platform is fully compatible with tungsten-based composites: alloying elements, ceramic reinforcements, or secondary metal powders co-sintering.

Gradient-composition parts are also achievable by varying the powder blend, opening the door to functionally graded components.

Moreover, the high energy process allows for direct diffusion bonding of tungsten to dissimilar metals, eliminating the need for intermediate joining steps and providing robust, metallurgical interfaces suitable for demanding aerospace, nuclear and high-temperature industrial applications as first wall materials for fusion reactors.

Collaboration opportunities

TECNALIA offers this advanced processing route to companies and research institutions across sectors that require tungsten or tungsten composites and dissimilar joining. The organization is prepared to transfer the technology or collaborate on projects to assess its feasibility and tailor it to new industrial applications.

Fusion for Energy Technology Transfer Programme

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