TECHNICAL NOTE

ITER / F4E – Tungsten Cladding for Temporary First Wall (TFW)

Introduction

The Temporary First Wall (TFW) is an inertially cooled plasma-facing protection system installed on the ITER Blanket Shield Blocks during the Start of Research Operation (SRO) phase. It provides full first-wall coverage to protect in-vessel components from thermal, electromagnetic and disruption-related loads prior to installation of the actively cooled First Wall. The TFW is composed of multiple panels arranged in 18 poloidal rows, each panel integrating a stainless-steel support structure equipped with removable tungsten-armoured tiles mounted on fingers.

Fusion for Energy is preparing for the procurement of this component and looking for companies with experience in cladding tungsten onto stainless steel. This document provides high-level technical requirements for cladding process.

Materials and Substrate

- Substrate: Austenitic stainless steel EN 1.4404 (316L).
- Cladding material: Tungsten, with chemical composition according to the following table:

Element	Composition max, wt. %	Permissible variation in Check analysis, wt. %
C	0.010	±0.002
O	0.010	+10% relative
N	0.010	+0.0005
Fe	0.010	+0.001
Ni	0.010	+0.001
Si	0.010	+0.001

The minimum tungsten content shall be 99.94%.
Significant impurities: Co < 0.05 %, Nb < 0.10 % and Ta < 0.01 % (wt.)

Geometry and Thickness

- Typical stainless steel tile dimensions: 160mmx100mm, thickness 12 mm
- Nominal tungsten cladding thickness: 0.01–1.0 mm.
- Thickness variation: ±10% of nominal value.

Qualification requirements

Test	Acceptance criteria
Visual and microscopic examination	Imperfections >0.5 mm reported
Adhesion test	No delamination (method/standard to be defined and agreed)
Destructive and non-destructive testing	NDT methods and detection limits to be defined and agreed.
Surface roughness	Ra ≤ 1.6 µm
High Heat Flux Testing (performed by F4E) • Long pulse: 2 MW/m², 500 cycles. • Short pulse: 0.20 GW/m², 100 cycles	No delamination

PVD/CVD coatings have been shown to delaminate under high heat flux testing and therefore shall not be used.

Market survey

With this Market Survey, F4E would like to identify capable EU companies/entities with experience related to the scope that is the subject of this Technical Note. Extensive experience coating Tungsten onto Stainless Steel will be particularly valued.

Interested companies/entities are invited to answer the questions and submit the requested information as instructed on the F4E Industry Portal. Information submitted will be accessible to F4E and ITER parties only and will not be disseminated to others (except with prior agreement from the respondent).

Based on the received responses, F4E may contact and visit interested companies/entities to further explore the market and technical conditions.