

2012 NTFR Subtask 1 Solid Surface PFCs Summary

for IEA ExComm Meeting at SOFT2012

prepared by Richard E. Nygren
Sandia National Laboratory
Chair, NTFR Subtask 1

contributors:

EU Jochen Linke, KFJ
RF Radmir Giniyatulin, Efremov
JA Satoshi Suzuki, JAEA
US Dennis Youchison, SNL



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Subtask 1 Participants

<u>Partner</u>	<u>representative(s) - other(s)/changes</u>
EU	<i>Jochen Linke, Corinna Thomser</i> <i>M. Rödig retired</i>
US	<i>Richard Nygren (chair), Dennis Youchison</i> <i>Nygren returns as chair replacing Youchison</i>
Japan	<i>Sato Suzuki, Mikio Enoida</i>
Russia	<i>Igor Mazul, Radmir Giniyatulin</i>
India	<i>Sameer Khirwadkar</i>
Korea	<i>Suk-Kwon Kim</i>
China	<i>Yican Wu</i>
Other:	<i>Marek Rubel (Sweden)</i>

Annual Report

2011 Progress Report (Youchison, Mazul, Khirwadkar, Loewenhoff, Suzuki)

A meeting of the subtask leaders occurred on September 14, 2011 in Portland, Oregon, USA at the ISFNT-10 conference. The agenda included presentations summarizing the 2011 activities by each leader followed by an open discussion on 2012 work plans. Participants present included the EU, IN, JA, RF, and US.

2012 Progress Report (Nygren et al., yet to be completed)

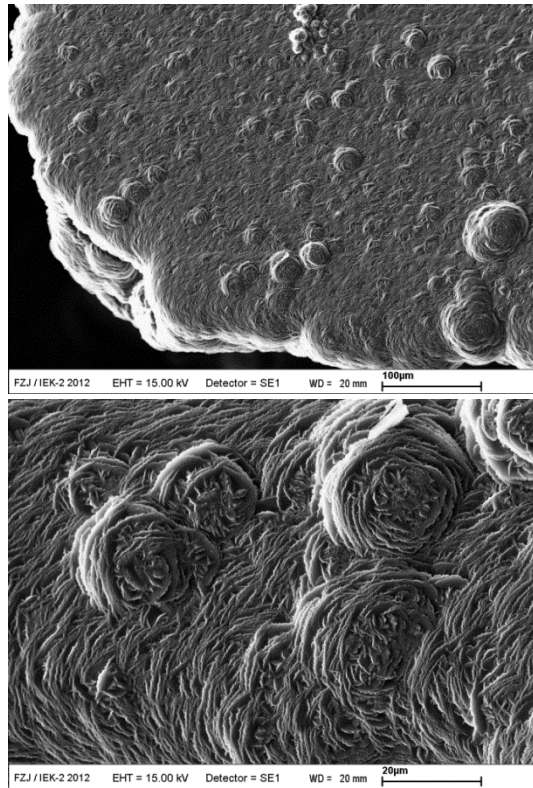
Planned with venue at SOFT2012 was postponed to coincide with the ITPA Topical Meetings in San Diego Oct 2012. Two principals (Nygren and Linke) could not attend SOFT. Nygren had to withdraw at last minute due to commitments on site at Sandia. Nygren will prepare summary for ExComm after this meeting.

Subsequent viewgraphs show summaries from some participants.

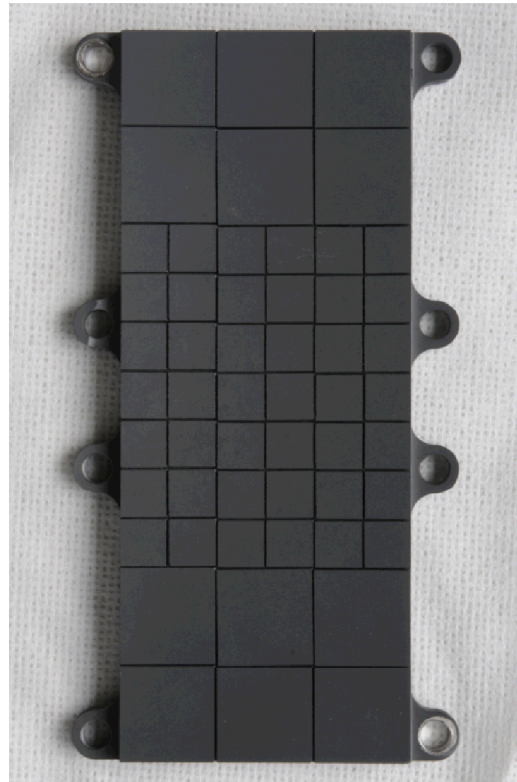
EU progress in 2012: EU-Russia

Pre-characterization of Be-coated
W target plates for ELM
simulation tests in QSPA-Be

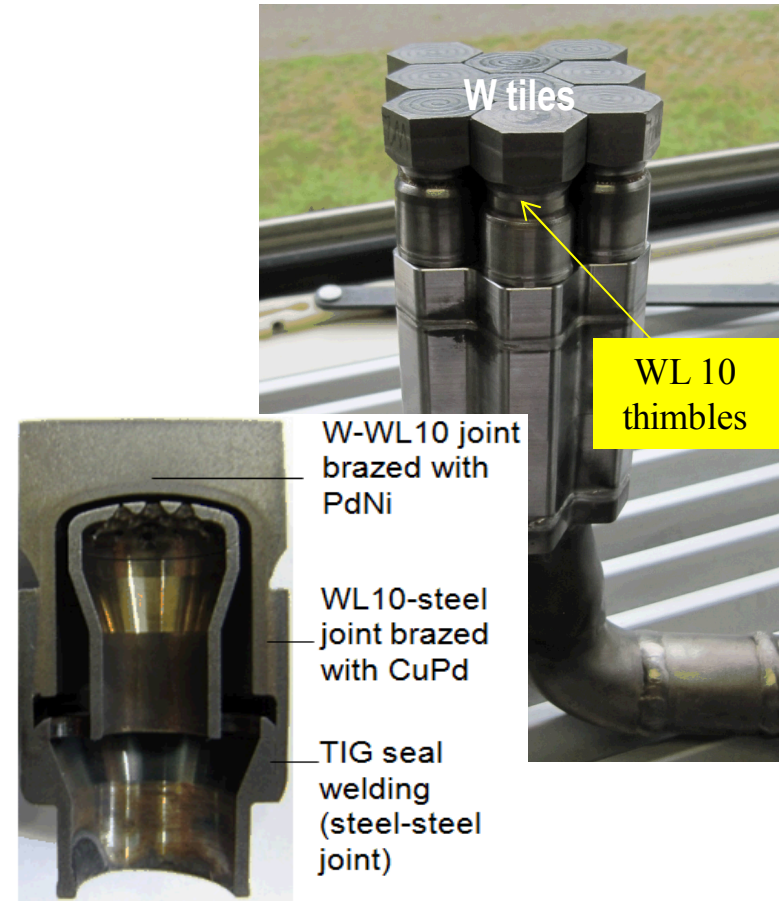
He-cooled divertor for DEMO,
successful 9-finger module
production for HHF tests



Be coating
SEM micrograph



target plate, W tiles
on SS support plate



EU progress in 2012: EU-Japan

Low pulse number thermal shock tests in JUDITH 1

production route: mech. alloying + SPMM*

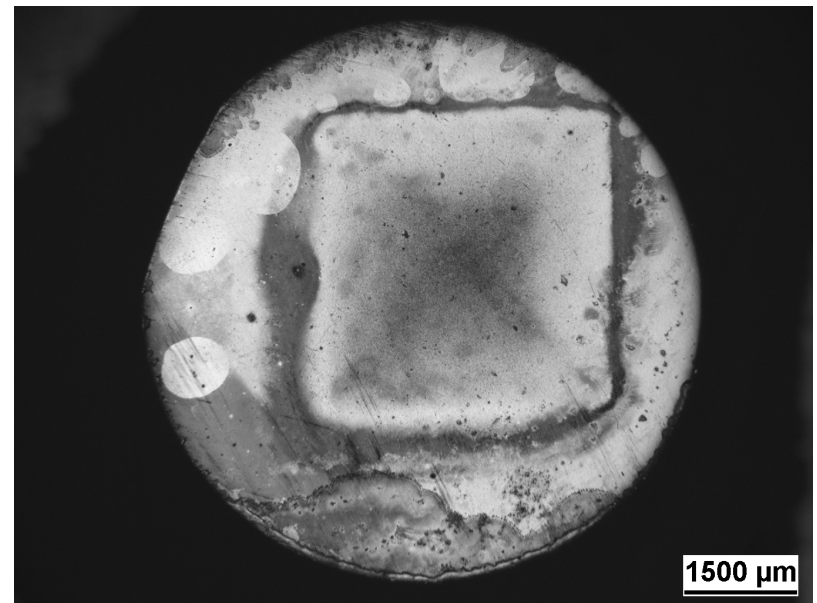
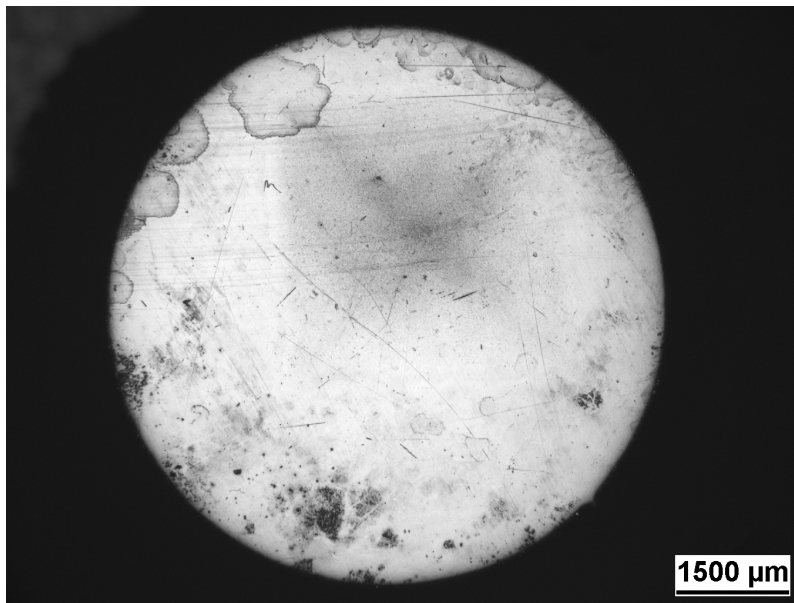
result: increased toughness
enhanced fine grain material
isotropic grain orientation

**super plasticity based
microstructure modification,
material provided by H.
Kurishita, Tohoku University*

- W-1.1TiC / 1650 °C / 200 ppm O
100 °C and 1.13 GW/m²

n = 100, $\Delta t = 1$ ms
RT and 1.13 GW/m²

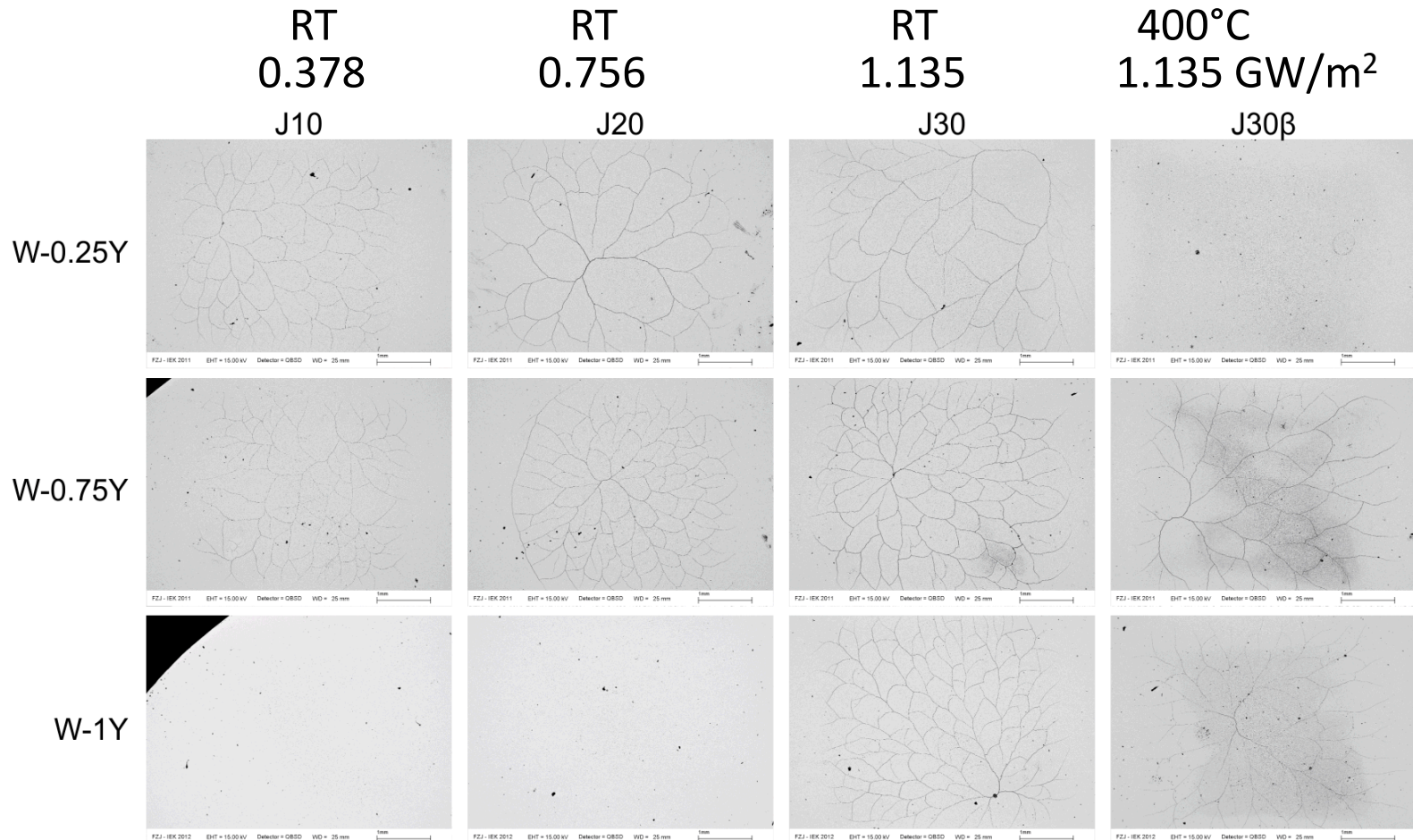
- no detectable surface roughening after 100 pulses even at RT



EU progress in 2012: EU-China

Performance of yttrium-doped W under ITER relevant transient thermal loads for 100 cycles

test specimens manufactured by USTB



RF progress in 2012

IDTF passed its qualification process and is ready for HHF tests of the vertical target and dome/liner for the ITER divertor during their serial production. First full-scale prototype will be tested in this year.



IDTF (800 kW)

TSEFEY (200 kW)



TSEFEY performs HHF testing programs with Be - armored PFC's:

- tile size optimization
- defects determination
- life-time examination

Be-compatible plasma-gun started operation (Bochvar Institute, TRINITY)

- Be-tiles studies with simulated plasma transient events are under way
- Preparation for testisof two beryllium grades (S-65 and TGP-56FW)

Japan progress in 2012

Subtask 1 activity:

To develop a solid surface DEMO divertor, JA manufactured small and medium divertor mock-ups with pure tungsten monoblock armor tiles in 2012, as shown in Fig. 1 and 2.

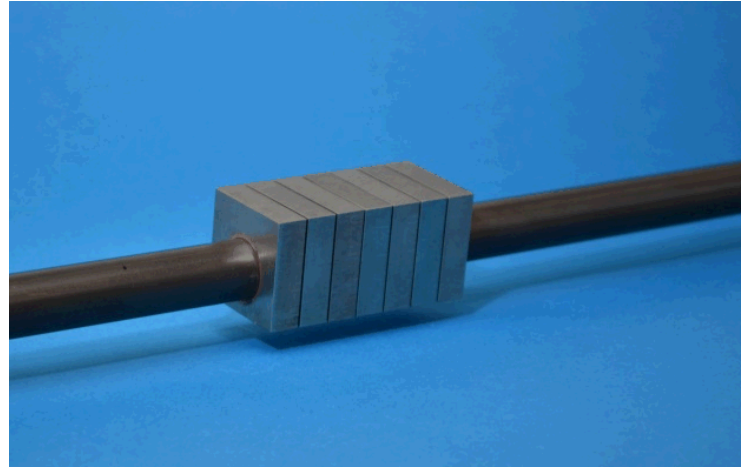


Fig. 1 Small-scale tungsten divertor mock-up



Fig 2. Medium-scale tungsten divertor mock-up

JA plans to perform high heat flux test not only in JA's test facility but also in other test facilities under the IEA-NTFR Annex 2 Subtask 1 collaboration to make comparison of the results to be obtained.

JA is going to start negotiation with FZJ on HHF testing in the Judith facility.

US progress in 2012

- Interest continues in DEMO relevant He-cooled PFCs.
- Some changes have occurred in US capability.

Plasma Materials Test Facility stopped operation after a Li fire occurred in August 2011 and did not perform testing in 2012. The DOE Office of Fusion Energy Sciences will not fund further testing in PMTF.

The US has ongoing collaborations with IEA/NTFR partners although not specifically included in the NTFR Subtask 1.

- US-Japan workshops on HHF and High Power Density (HPD) typically include IEA auspices and some participants outside the US and Japan. Japan hosted an HHF in August 2011 and the US is hosting an HPD workshop in October 2012 in San Diego.
- He-cooled PFCs for DEMO are active subjects in both the US-Japan PHENIX (post-TITAN) activity and the US-PRC bilateral collaboration.
- UCSB hosted an excellent workshop on tungsten in February 2012 with broad international attendance.
- Collaborations with JA, CH and/or EU by UCSD, U. Illinois, MIT, PPPL, GA, ORNL and Sandia in plasma materials interactions and materials.

E N D

Thank you.