IPPLM activities in 2022 on WEST and W7-X samples

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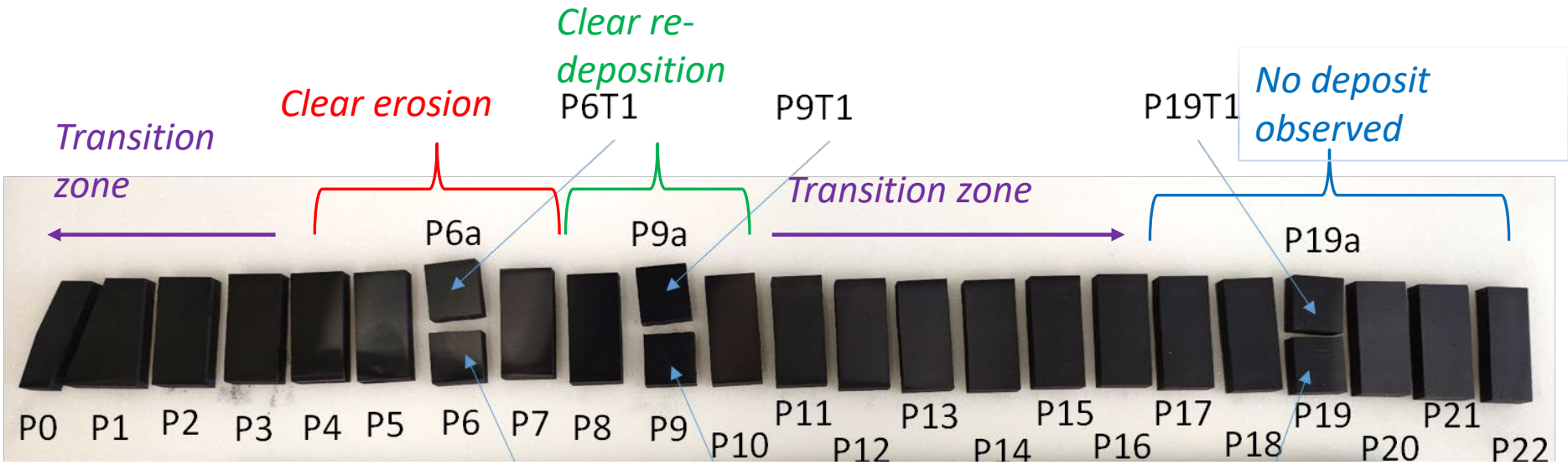
Plans for 2022
Deliverables

- SP. B2: SEM, TEM and FIB characterization of selected samples from experiments on WEST and W7-X with conclusions

- SP. B3: SEM, TEM and FIB characterization of selected WEST PFUs and plasma-exposed reference samples

W7X samples

Tile HM19TM400hTE2



Examined samples: all**.**

The aim of the work: (i) assess surface modification of the material caused by the plasma–wall interactions (erosion/deposition pattern), (ii) study the co-deposits formed and (iii) analyze the dust particles found.

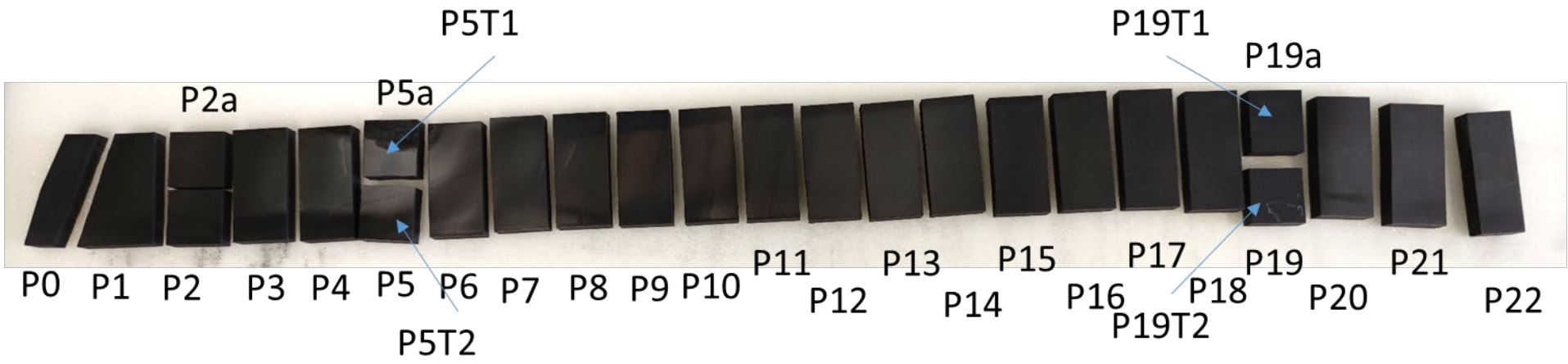
Techniques used: SEM, TEM, STEM, FIB, EDS and optical profilometry.

Work to be completed:

- roughness measurements performed at each sample at 3 magnifications, but not yet analysed
- additional TEM analysis of sub-surface structure in the transition zones planned (abstract E. Fortuna-Zalesna et all „Erosion and redeposition pattern on the W7-X graphite test divertor unit tile” submitted for the 32 nd SOFT)

W7X samples

Tile HM19TM400hTE1



First observations of samples morphology started.

Summary: W7-X

The main results are:

• Distinct erosion zone is located in the region located close to the pumping gap, in the inner horizontal target strike line position. The surface is smoothed, however small
amounts of impurities were revealed in the shallow cavities present on the surface.

• The area covered by a distinct deposit is located just next to the erosion zone. The main deposit constituents are carbon and oxygen. The deposit includes also a small amount of iron and other steel components. It has an amorphous structure with clearly visible sublayers. In the examined area, its thickness was up to 2.7 μm.

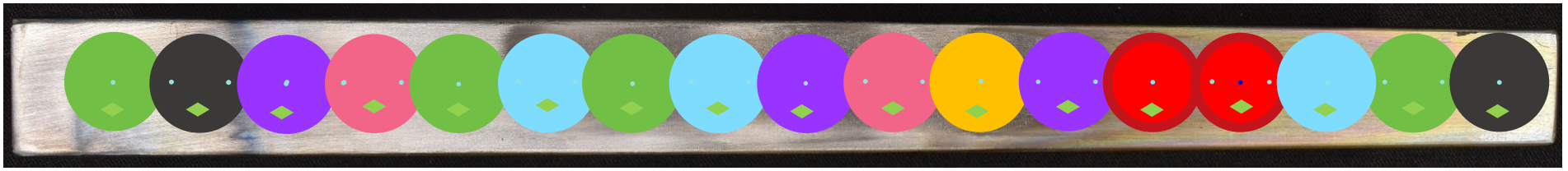
• Two transition zones were localized: (i) on the left from the erosion zone, towards the pumping gap side and (ii) on the right from the region with strong re-deposition.

• The target finger substructures located close to the outboard side do not show any evidence of re-deposition

C4-32i and C4-20o tiles: sample nomenclature & repartition

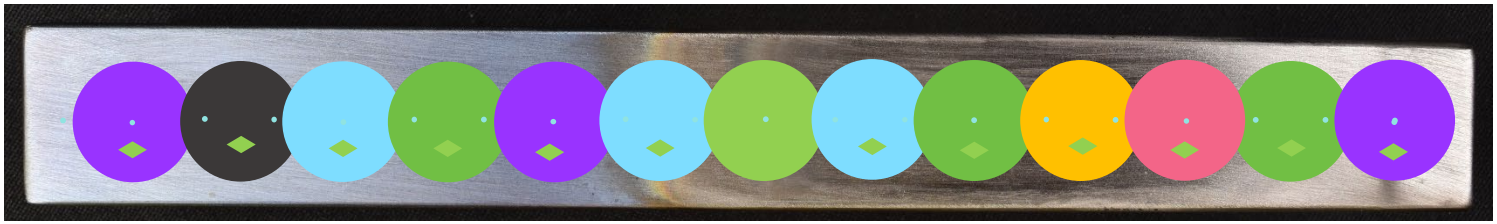
C4-32i: 17 samples

SPARES (2)



C4-32iQ C4-32iP C4-32iO C4-32iN C4-32iM C4-32iL C4-32iK C4-32iJ C4-32iI C4-32iH C4-32iG C4-32iF C4-32iE C4-32iD C4-32iC C4-32iB C4-32iA 0

C4-20o: 13 samples



C4-20oM C4-20oL C4-20oK C4-20oJ C4-20oI C4-20oH C4-20oG C4-20oF C4-20oE C4-20oD C4-20oC C4-20oB C4-20oA 0

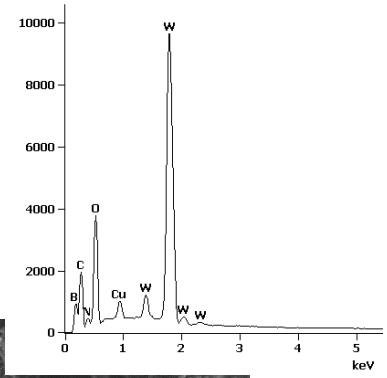
VR (NRA,PIXE,ERDA)
+ IPPLM (SEM, TEM)
VTT (SIMS)
RBI (RBS, tofERDA)
JSI (µNRA, ERDA)
IAP (GDOES)
UT (LIBS)

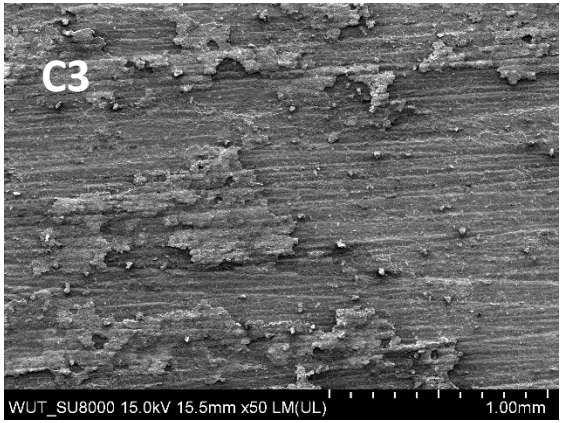
C4 WEST samples

3 samples already in Poland: C4-32iJ, C420oK and C4-20oF.

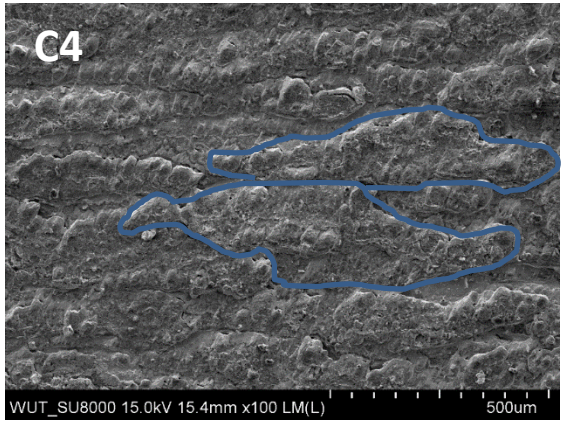
- *First observations of the surface morphology done. Different surface morphology to that observed during the C3 campaign,*
- *The FIB cross-sections should be ready by the end of May at the latest to provide additional data for the article to be prepared by M. Diaz for the PSI conference.*

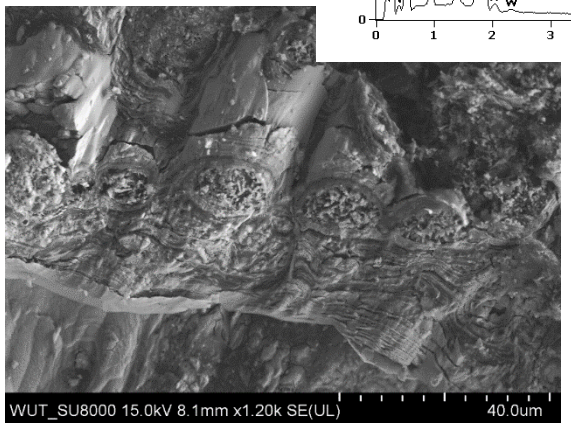
Preliminary results - inner divertor sample C4-32iJ





Flaking, stratified deposits present on the surface

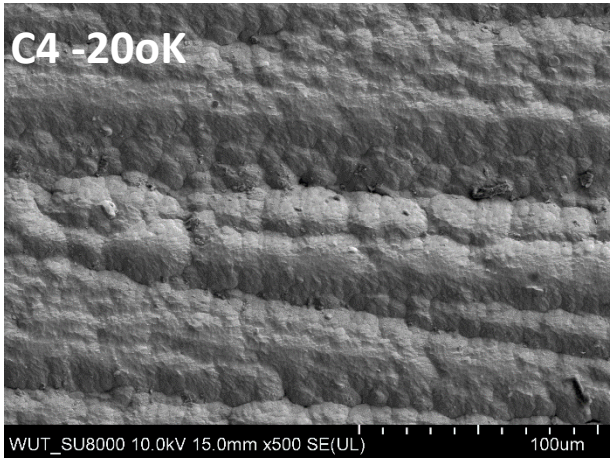


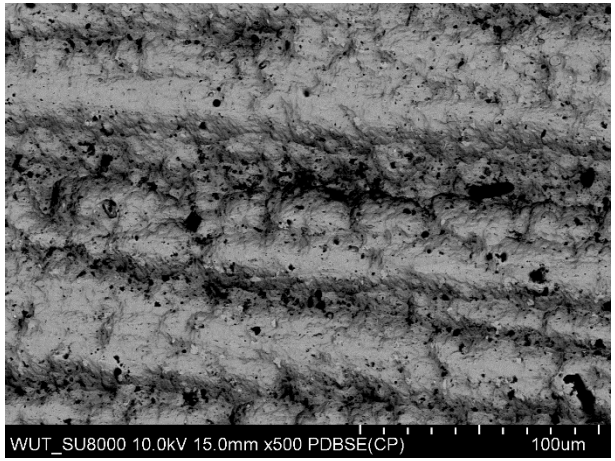


Thick deposit present, however of different morphology to that observed during C3 campaign. Deposit areas resemble flakes. Except stratified deposit observed during C3 campaign, the elongated, cylindrical objects with compact shell are frequently observed.

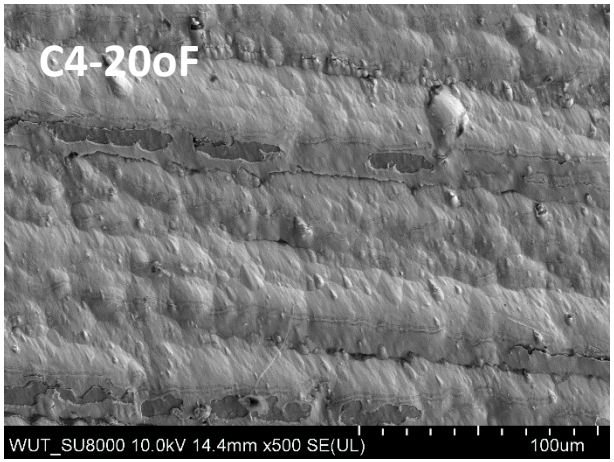
C4 WEST samples

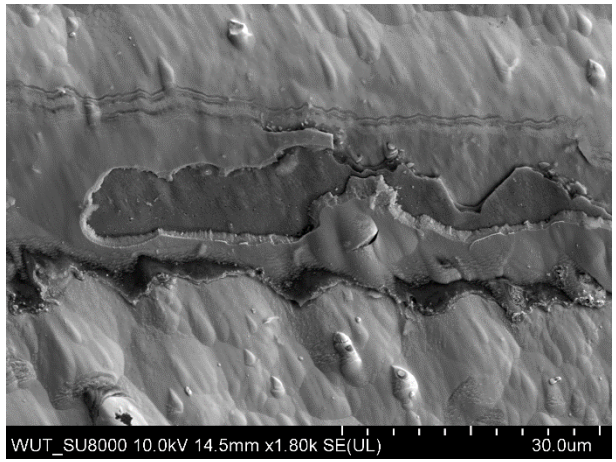
Preliminary results - outer divertor sample C4-20oK and C4-20oF

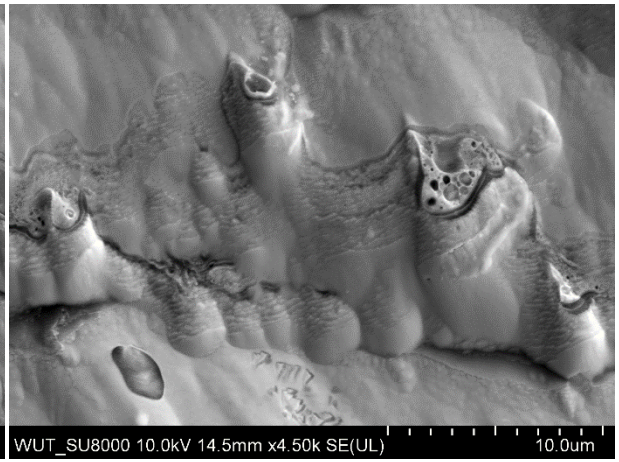




No deposit observed at samples after C3 campaign. After C4 campaign deposit observed at the slope of the valleys.







Thick stratified deposit of different chemical composition within sublayers present. After C3 campaign thin deposit observed locally at the slope of the valleys.

Other samples to be examined

- *New reference samples received in Wednesday from the Politecnico di Milano WFW929 (W+O 15%),*
- *New PFU samples from WEST expected,*
- *New samples from W7-X, Magnum-PSI?*