SP B.4: IAP activities in 2021: W-based coatings with pre-defined properties (incl. *SEM*, *XRD*, *GDOES*, *TDS* characterization) produced for analyses and plasma experiments – plans and capabilities

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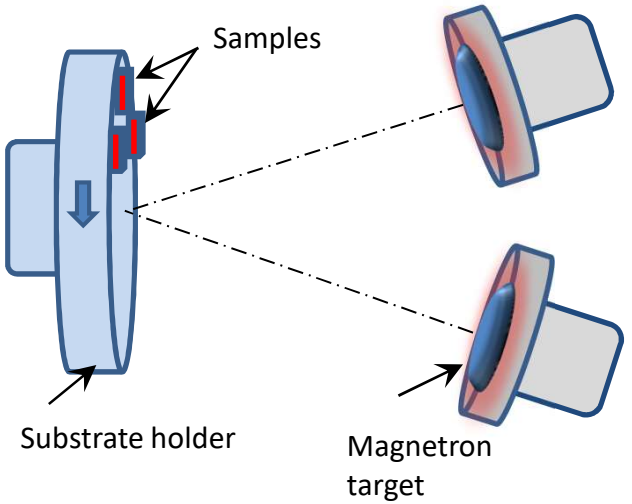
Processing capabilities:

Magnetron sputtering systems:

a) Single magnetron sputtering system powered by *DC* or *HiPIMS* (*High Power Impulse Magnetron Sputtering*) power supply

b) Dual magnetron sputtering system in confocal geometry. Can be energized:

- *DC-DC*
- *DC-HiPIMS*
- *HiPIMS-HiPIMS*



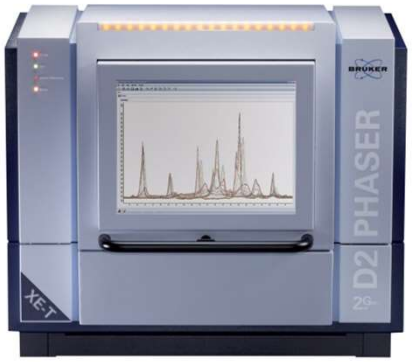
c) Industrial scale magnetron sputtering system assisted by a pulsed high voltage discharge *(CMSII Combined Magnetron sputtering and Ion Implantation).* Provided with 24 magnetrons

Analysis capabilities:

a) Glow Discharge Optical Emission Spectrometer (*GDOES*) able to perform depth profile analysis (29 elements +1). It is provided with a monochromator that can be set on a specific emission line

b) X-ray diffraction (*XRD*) equipment. Used for :

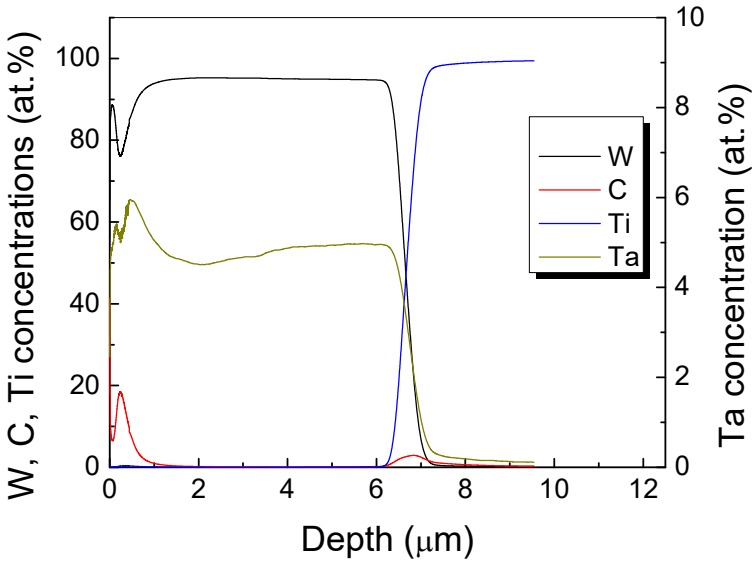
- *Phase analysis measurements*
- *Crystallite size measurements*
- *Quantitative phase analysis*



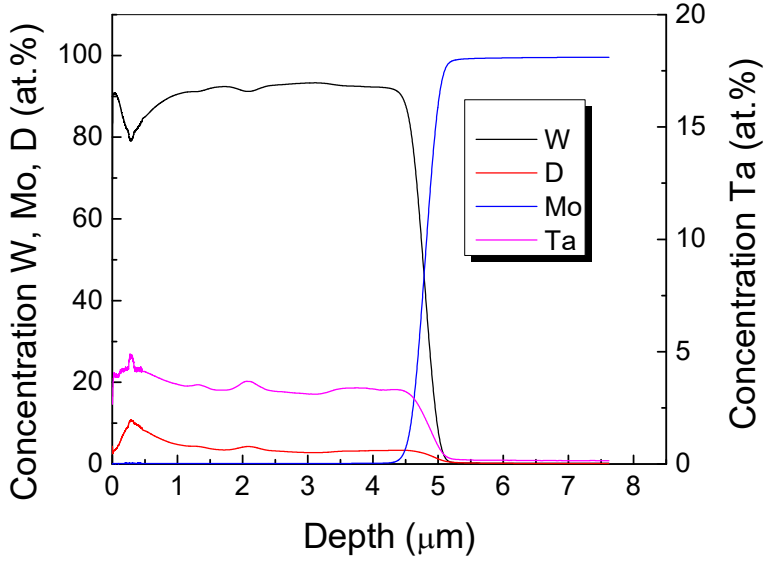
c) Thermal Desorption Spectroscopy (*TDS*) for qualitative measurement of gas release

W-Ta and W-Ta+D coatings

Results:



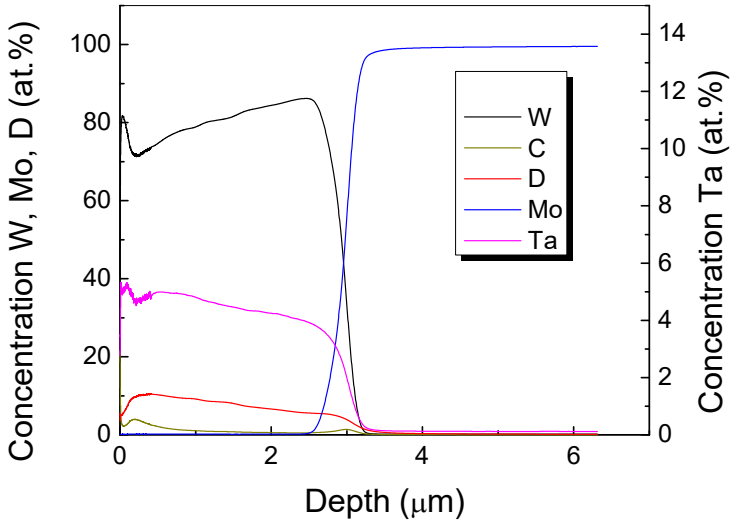
GDOES depth profile for a W-Ta coating



GDOES depth profile for a W-Ta+D 5% coating

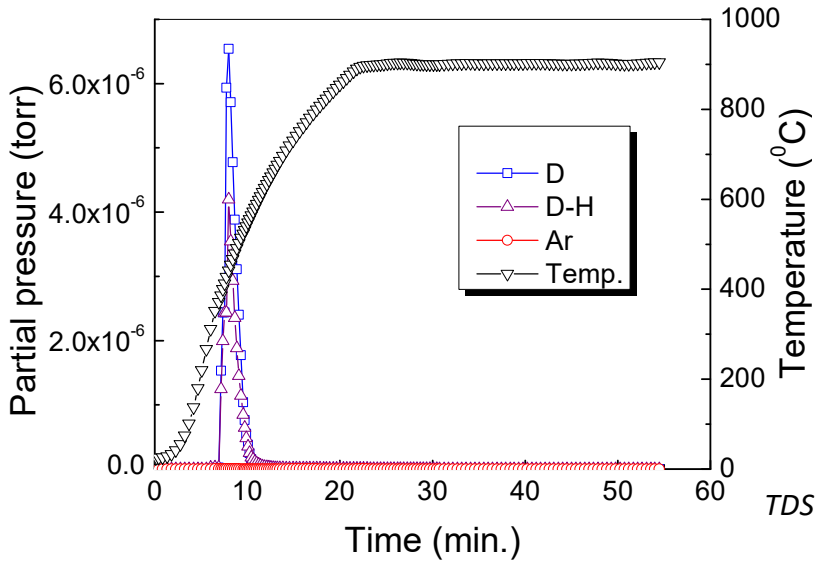
- W-Ta coatings of ~6.1 μm and W-Ta+D (4.8 μm) have been produced
- Ta content ~ 5 at% (W-Ta) and 3.5 at.% for W-Ta+D5 (*GDOES*);
- D content for W-Ta+D, was ~4.1 at.%; *ToF-ERDA* measurement 3.2 at.% (RBI Croatia)

W-Ta and W-Ta+D coatings



GDOES depth profile for a W-Ta +D 10% coating

- W-Ta+D10 (3 μm)
- Ta content 4.5 at.% for W-Ta+D10 (*GDOES*);
- D content for W-Ta+D10, was ~7.5 at.%; *ToF-ERDA* measurement 7 at.% (RBI Croatia)

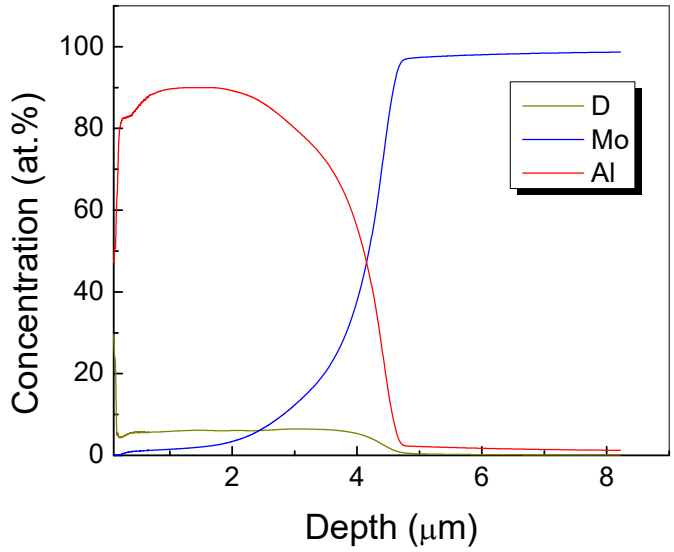


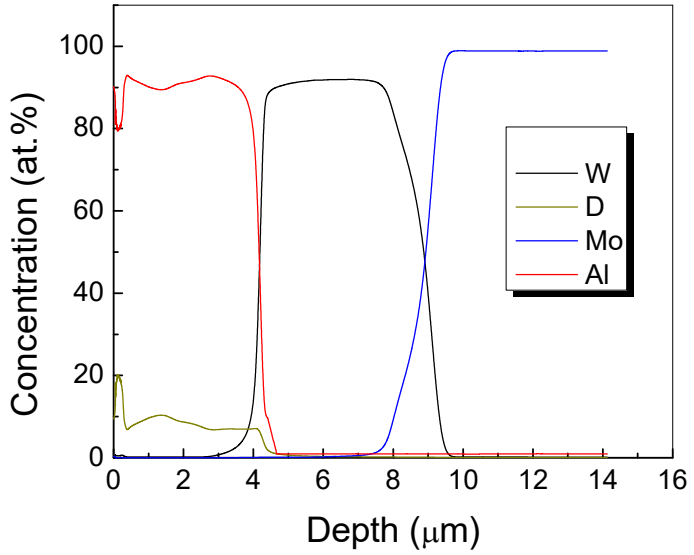
TDS spectrum for a W-Ta +D coating

- D release temperature ~420^0 C

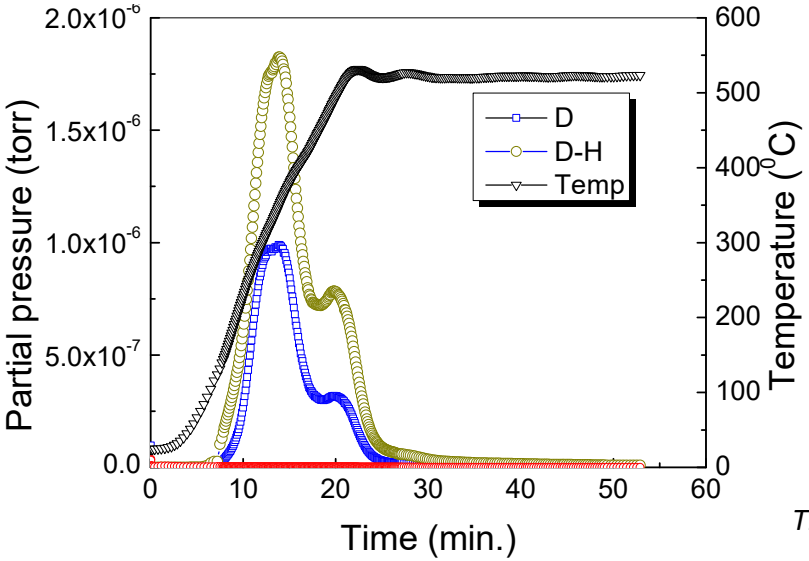
Al-D and Al-D/W coatings

Results:





GDOES depth profile for the Al-D coating on Mo substrate, respectively Al-D/W / Mo

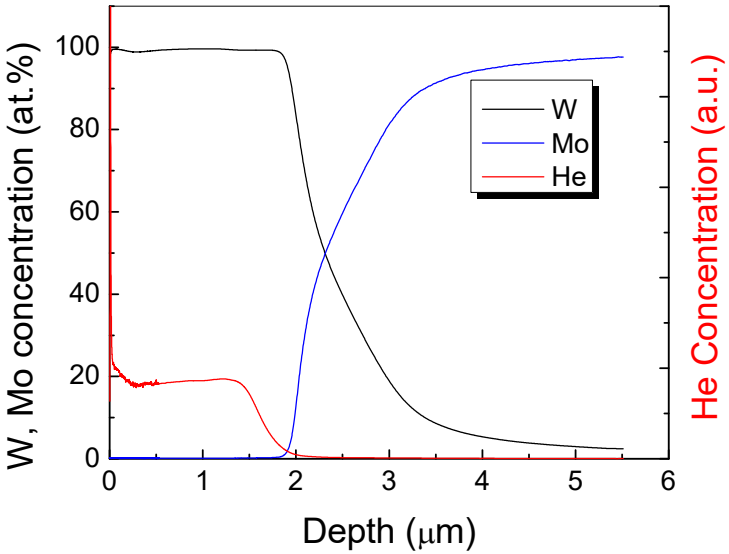


TDS spectrum for a Al+D coating

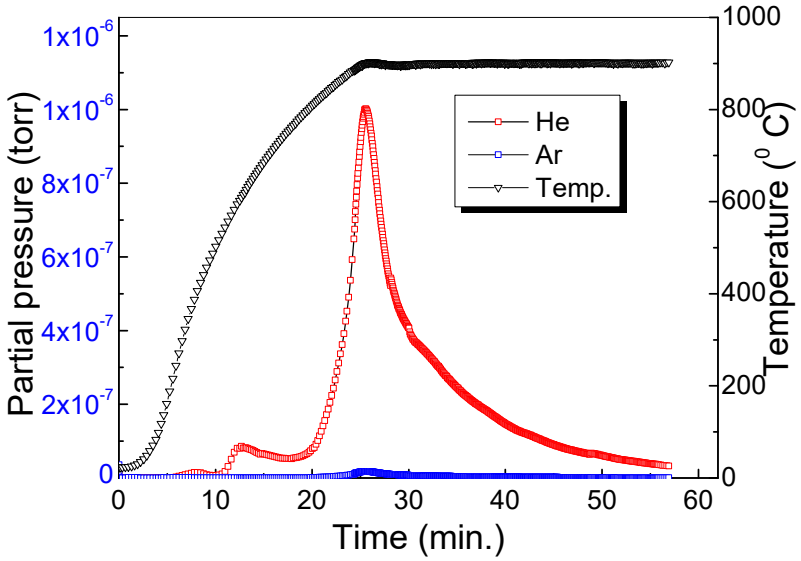
- Al+D/W coatings of ~4 μm and Al+D/W/Mo (4+5μm) have been produced
- D content ~ 6 at% (Al+D/W) and 8.6 at.% (Al+D/W/Mo) (*GDOES*); *ToF-ERDA* measurements (*RBI*) 6.1 at.% and respectively 10.6 at.% (RBI Croatia)

W+He

W+He coating:



GDOES depth profile for a W-He coating



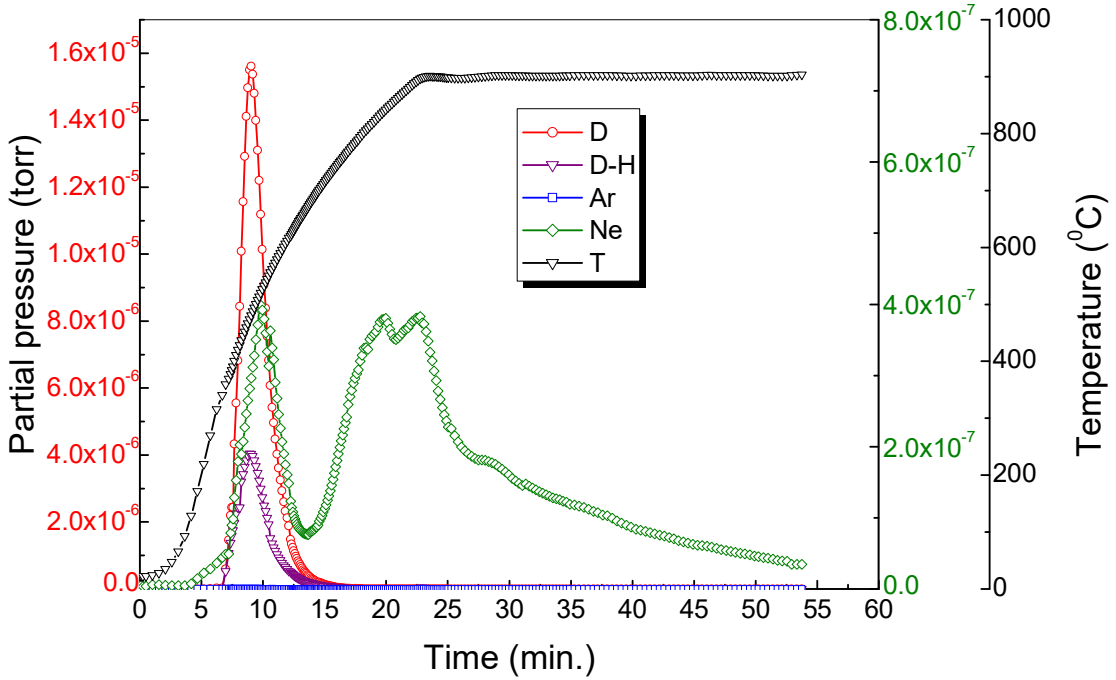
TDS spectrum for W+He coating

- W+He/Mo coating of ~2.5 μm
- He content not quantified (He reference samples not available)
- He release temperature ~900^0 C

W-Ne+D

❖Production of (W-Ne-D) coatings; specifications: D~5 at.% and Ne ~5 at.%

- ❖ *TDS* measurements: D release temperature ~500^0 C, Ne release temperatures ~500^{0}C, ~800^{0}C
- ❖ *ToF-ERDA* measurement result: D 13 at.%, Ne 3.6 at.% (RBI Croatia)



TDS spectrum for a W-Ne +D coating

Thank you !