

SP B monitoring meeting 2024

SP B.5 - Production of B and W dust particles

Production of W and B dust particles by MSGA

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Production of B and W dust particles by MSGA

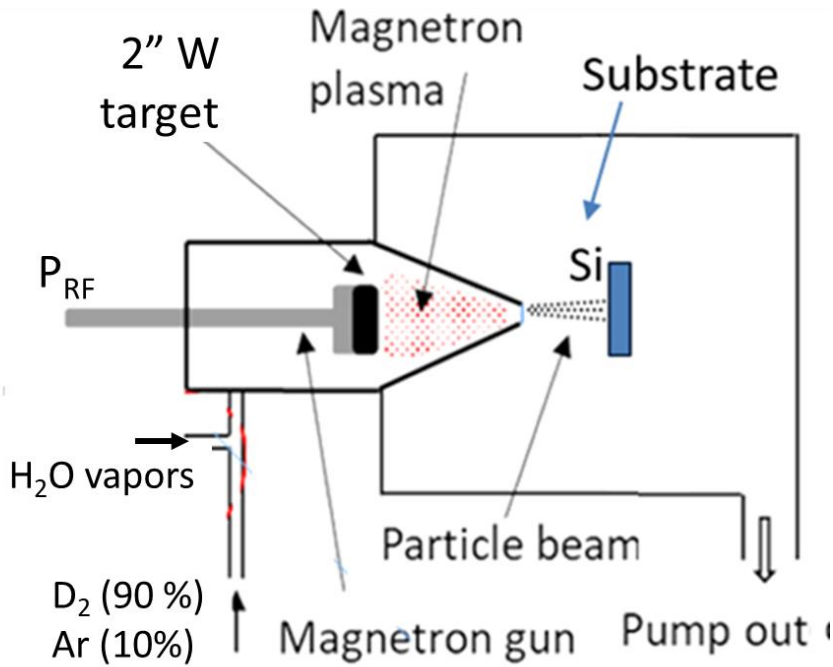
OUTLINE:

- MSGA (Magnetron Sputtering Gas Aggregation) system: short presentation and experimental parameters for:
 - Synthesis of W dust in $D_2/Ar/H_2O$ (90% D_2);
 - Preliminary tests of B-based dust in Ar, Kr, and additional gases (H_2 , N_2 , O_2).
- Dust synthesis rates and properties of the obtained dust (pointing to Deuterium retention for W dust).
- Future experiments.



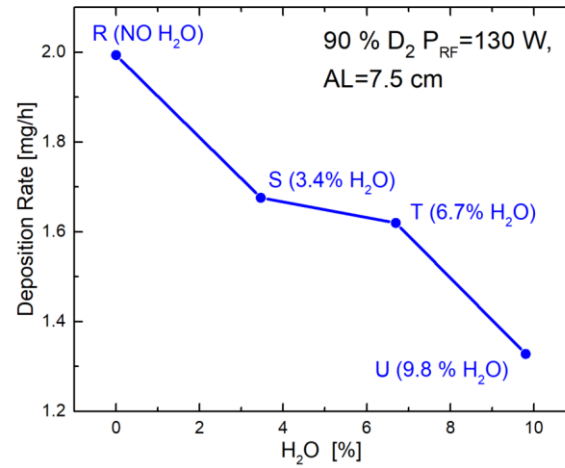
Effects of H₂O vapors on W dust production.

Experimental setup and parameters

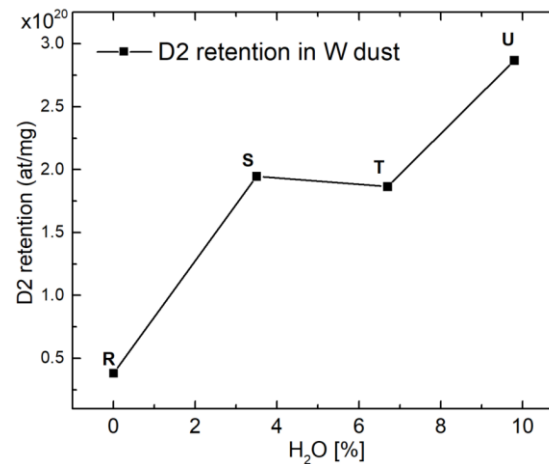


- Main gases: D₂ (90%) and Ar (10%);
- H₂O leaks added (up to 10% partial pressure).
- Deposition duration: 3h for one sample;
- P_{RF} = 130 W.

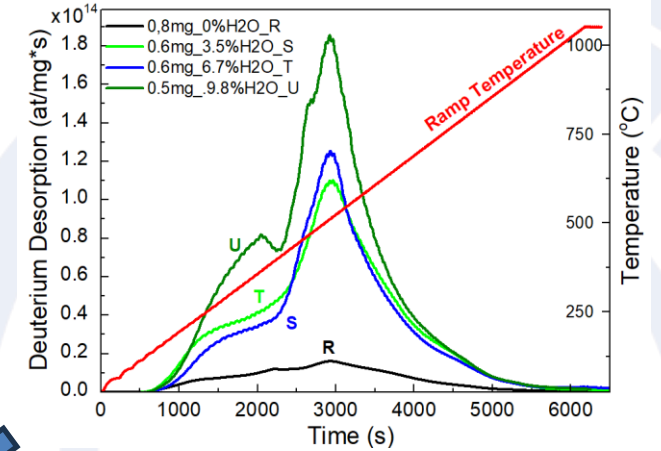
Deposition rates (by weighting)



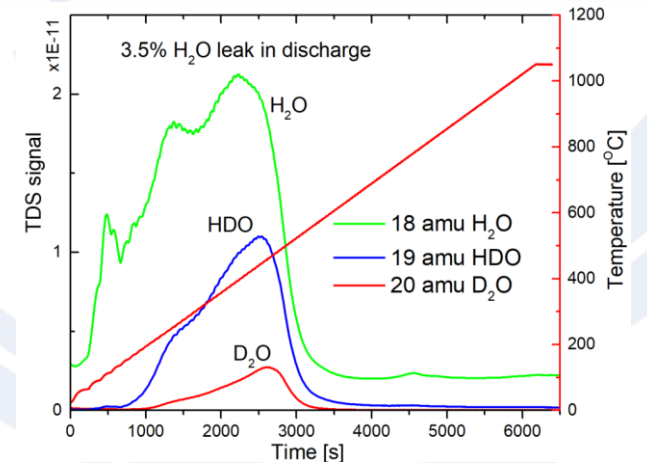
Deuterium retention



TDS results: Deuterium (C. Porosnicu group)



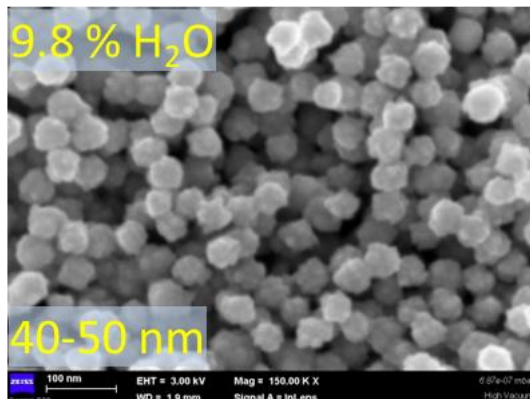
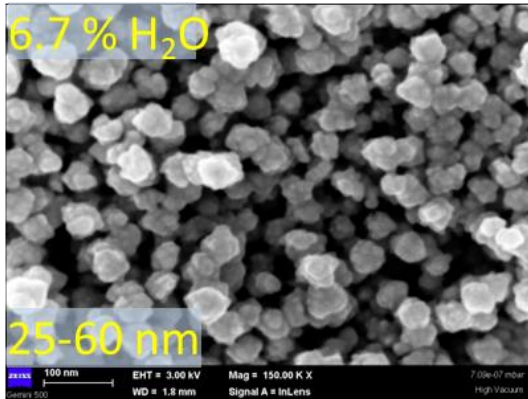
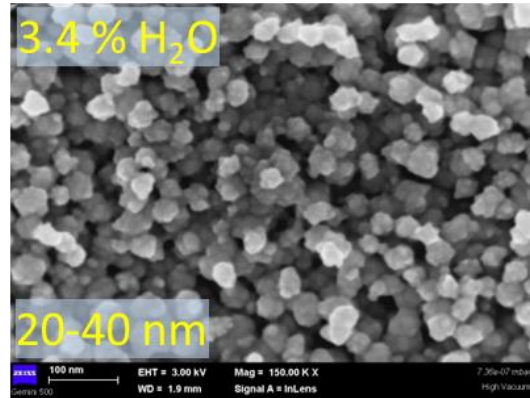
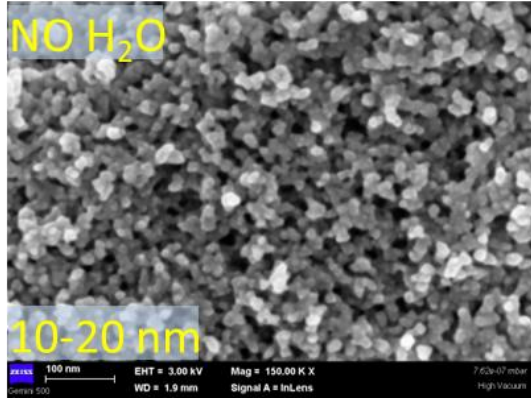
TDS evidence for H, D isotopic exchange





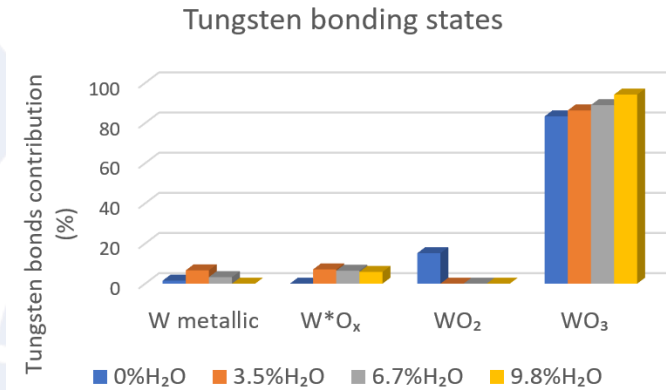
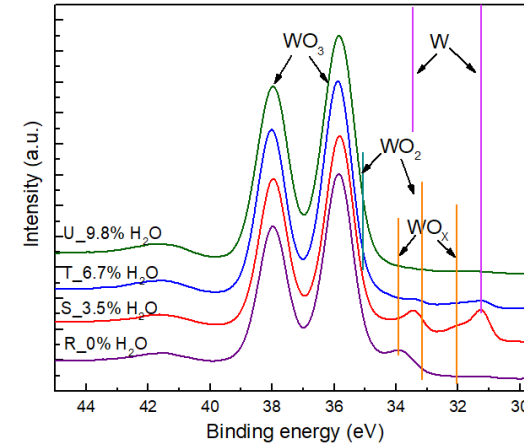
Effects of H₂O vapors on W dust characteristics.

Morphology (SEM)



Increasing the H₂O amount, the particle dimension increases, and these become more “disconnected”.

Chemical composition (XPS) results



H₂O lead to strong oxidation of the dust particles during their production.

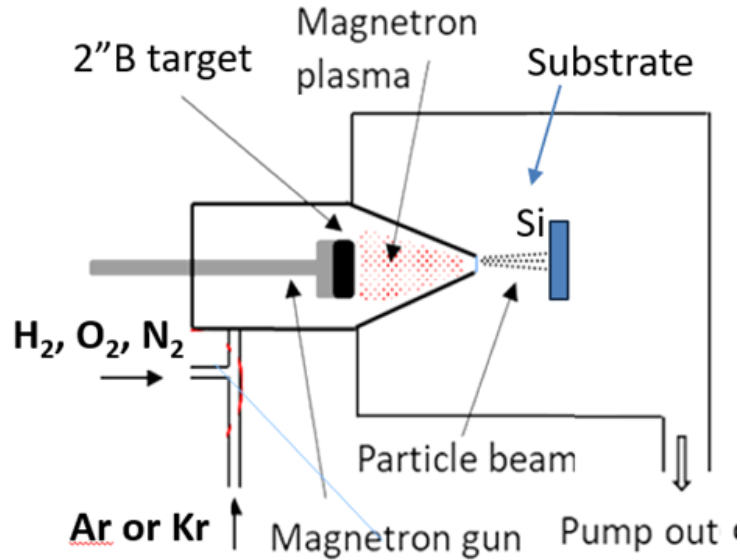
Conclusions on W dust:

- Deuterium retention increases with H₂O content, even if the dust synthesis rate decreases (similar to air leaks obtained last year);
- H₂O leaks lead to strong oxidation of the W dust;
- Formation of D₂O and HDO is observed.



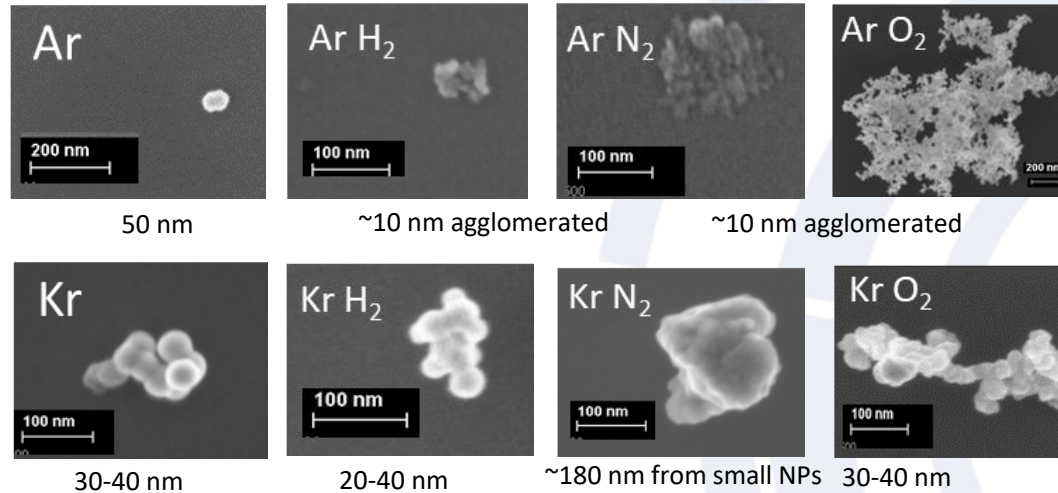
Production of B based dust particles

Experimental setup and parameters



Morphology (SEM)

First B particles obtained by MSGA :



Comments:

- Ar, Kr, and mixtures with H₂ or N₂ lead to sparse B NPs on the substrate;
- The addition of O₂ leads to an increase in the number of NPs;

Conclusions on B dust by MSGA:

- The synthesis rate of the B dust is much smaller when compared to W;
- H₂ addition **does not** increase the amount of dust (like happened with W);
- B NPs synthesis is influenced by the presence of impurities.

Possible future activities (next years):

- W and B dust synthesis in D₂-dominated discharges in the presence of different other gases.



Thank you for your
attention!