PROGRESS IN PREPARATION, CHARACTERIZATION AND COMPARISON OF BORON-COATINGS FROM FUSION AND LABORATORY DEVICES

28.10.26

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LAYER FABRICATION

Boron layer fabrication in laboratory: Magnetron sputter deposition



RF-mode, Ar plasma, pure boron target

- B layers
- BD/BH layers (same power, same deposition time)

Substrates used:
Polished and annealed W and 316L, Si waver

B layer deposition

- 50 sccm Ar, 140 W
- Approx. 5.5 h for 100 nm

BD 2:1 Ratio
40 sccm Ar:20 sccm D_2

BH 2:1 Ratio
30 sccm Ar:15 sccm H_2

THERMOBALANCE

Experimental Setup



Controlled Atmosphere
Argon, Nitrogen, Oxygen, Air

Furnace
Up to 2000 K

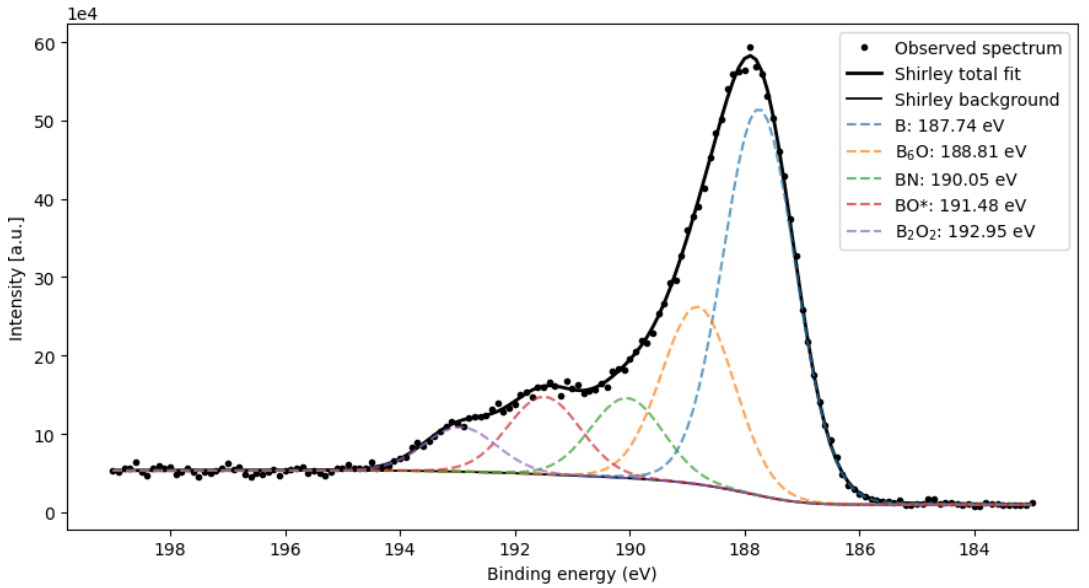
Controlled humidity generator
0 % - 100 % humidity at 340 K



MAGNETRON LAYER EXPOSURE

Preliminary Results, Analysis ongoing

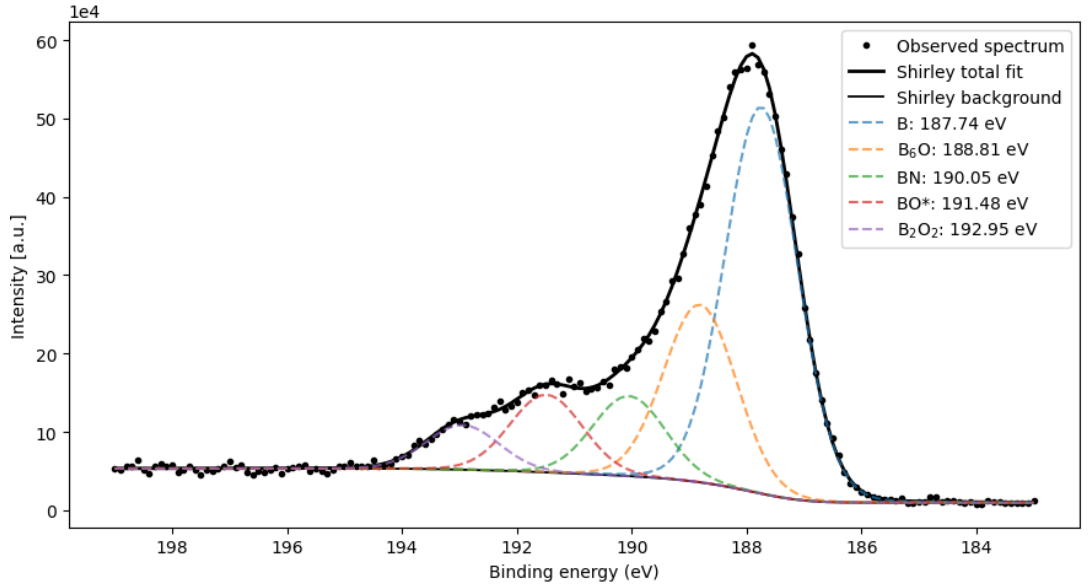
- **Magnetron** deposited B layer exposed to synthetic air 99.999% (O_2 + N_2) at 400 °C, duration: 1h
- **B2O2, BO*, BN** close to surface

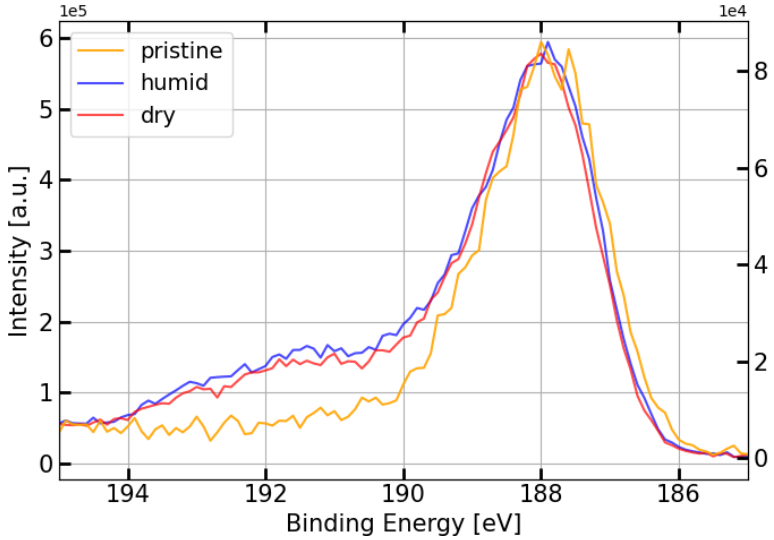


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- No difference between humid and dry exposure in B

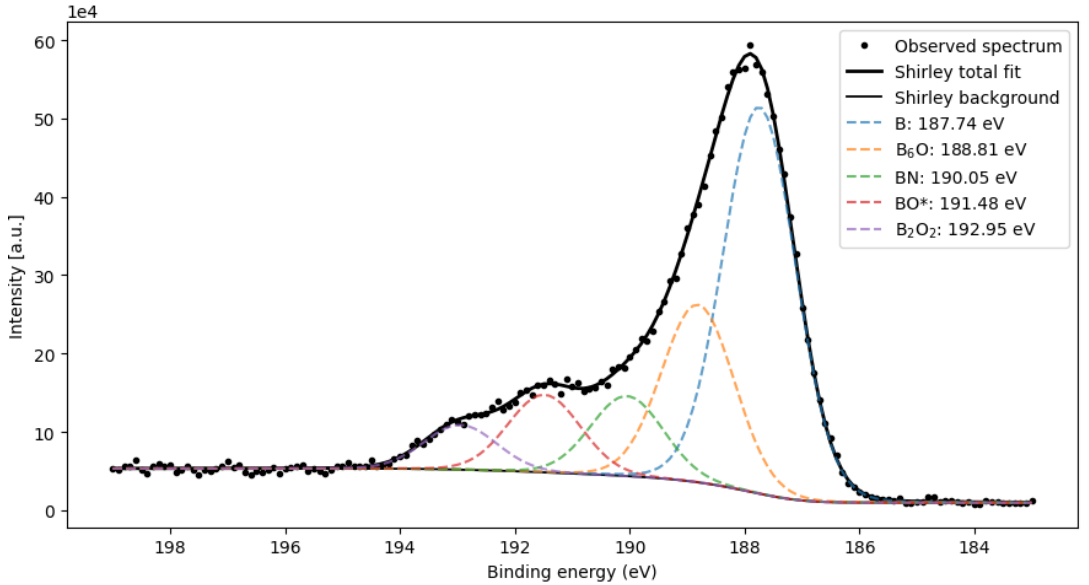


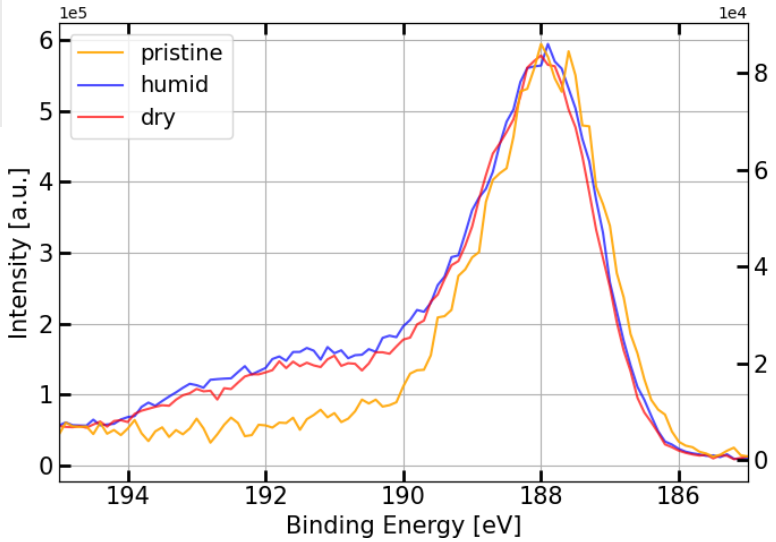


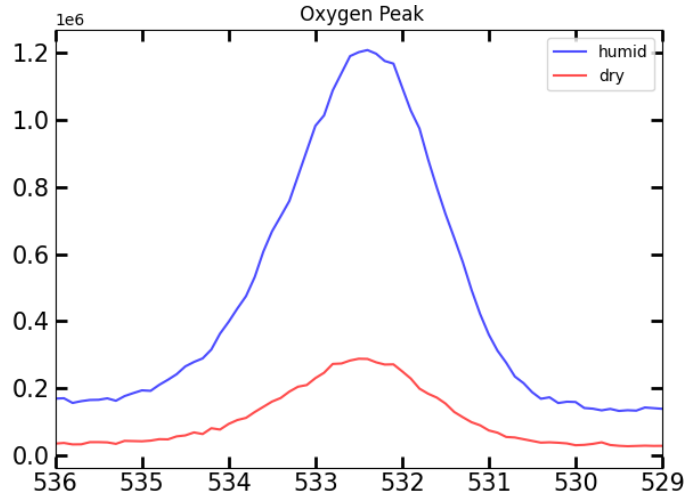
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- No difference between humid and dry exposure in B
- More oxygen uptake in humid exposure





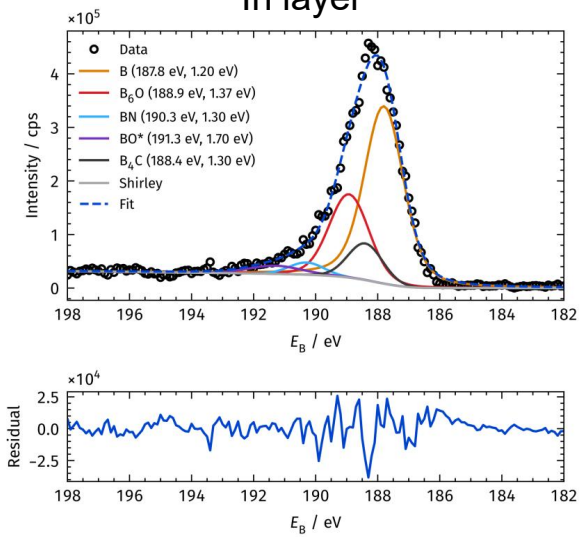


MAGNETRON VS FUSION DEVICE

- **Magnetron** deposited B layer ~110 nm
- Consists dominantly of B and B_6O

Magnetron

In layer



MAGNETRON VS FUSION DEVICE

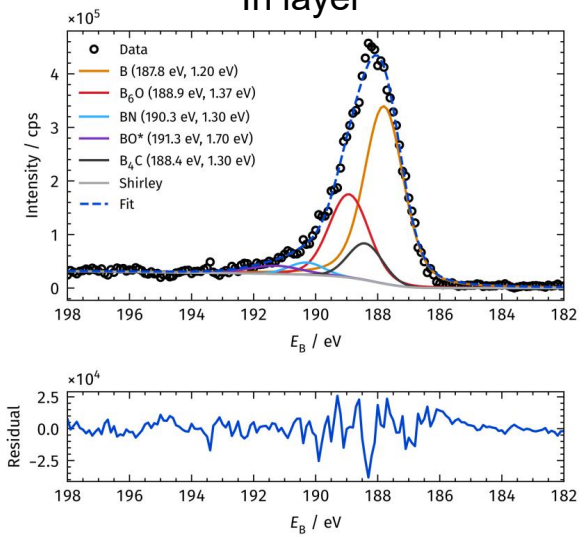
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- **Asdex-Upgrade** GDB B layer ~ 10-20 nm
- B_2O_2 removed after sputtering

- **No** stochiometric oxide $\mathbf{B_2O_3}$ or boric acid in **both layers**

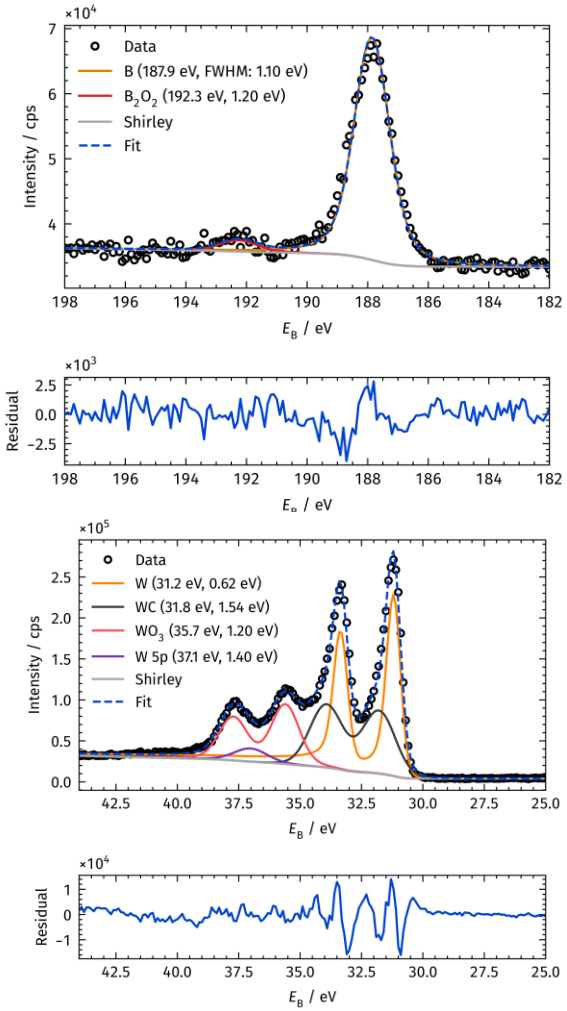
Magnetron

In layer

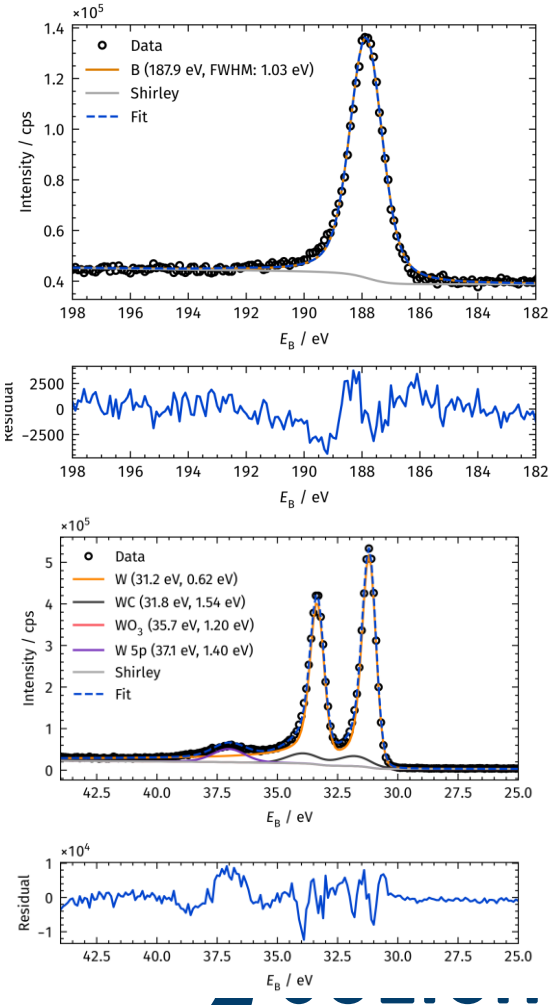


ASDEX-Upgrade

Surface



In layer



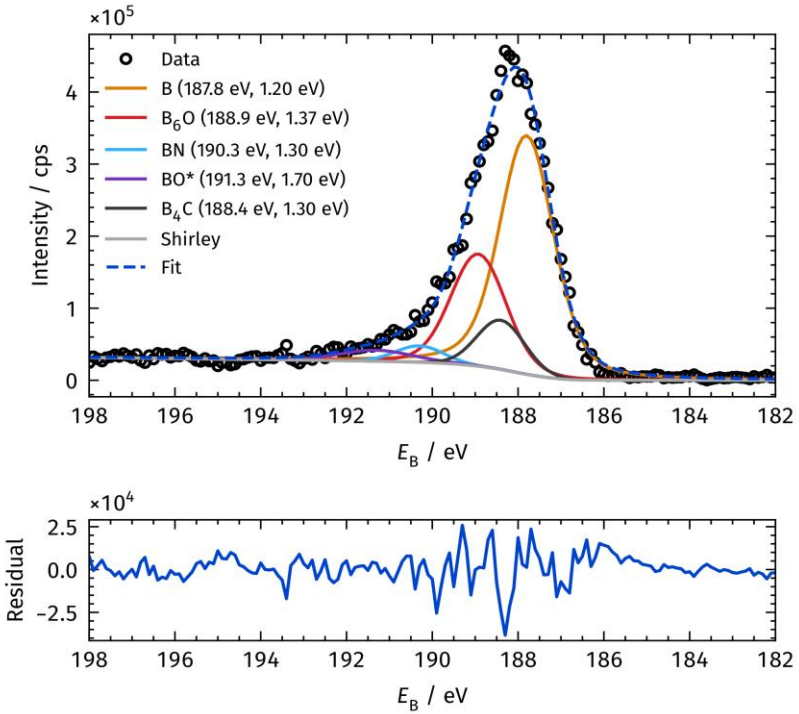
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- Exposing samples during GD Boronisation at **W7-X** on 06.11

- Planned to attend GD Boronisation at **WEST** on 30.11

Magnetron



ASDEX Upgrade

