MAX-PLANCK-INSTITUT
FÜR PLASMAPHYSIK

Dust investigations in AUG and WEST 2023 plans

ASDEX Upgrade

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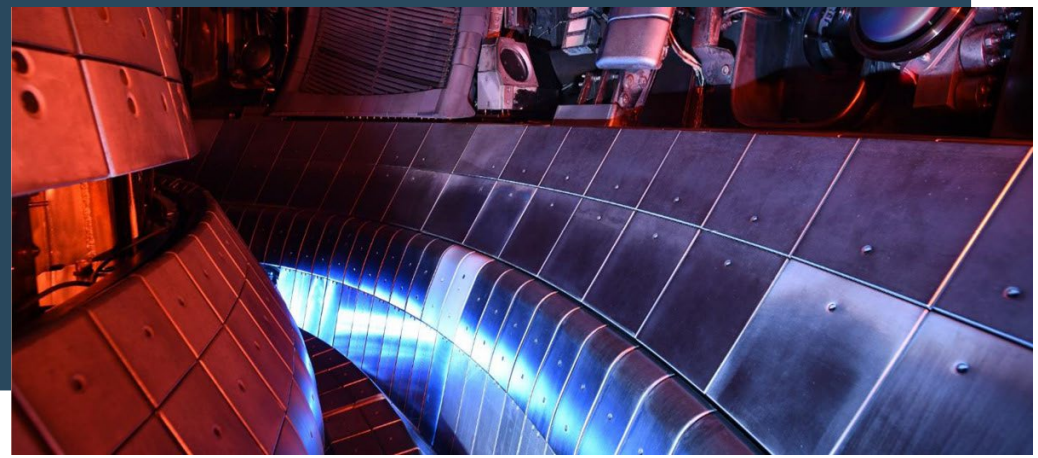

EUROfusion

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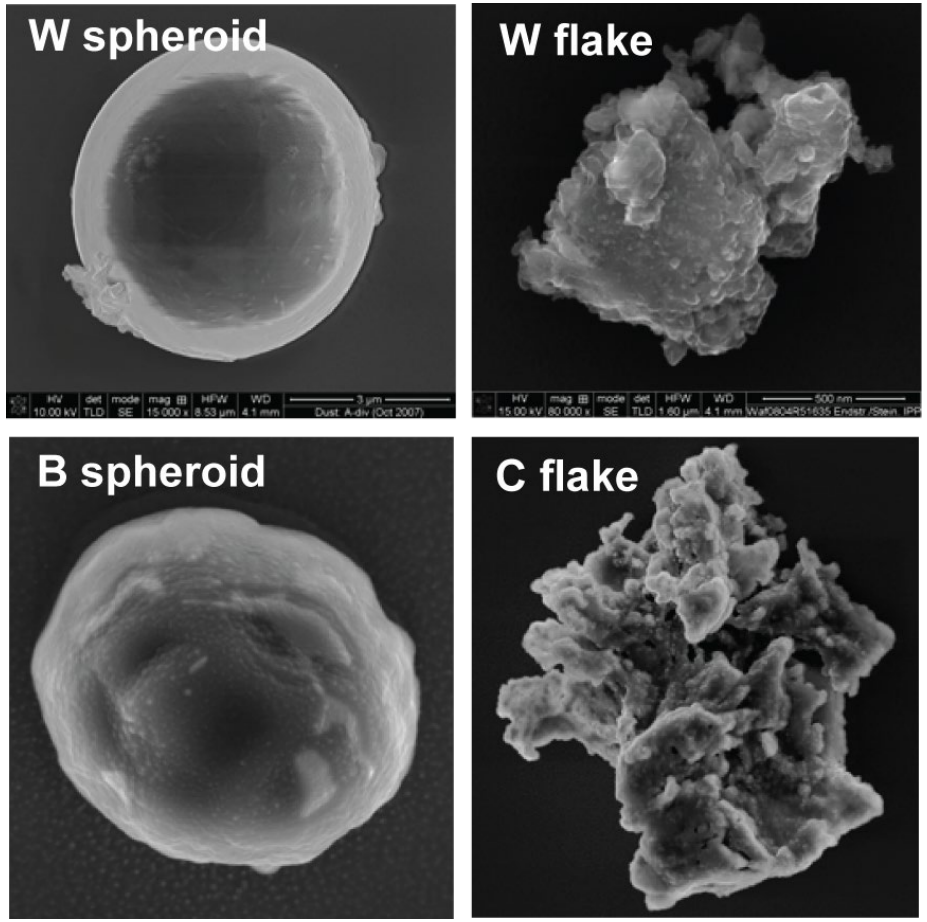
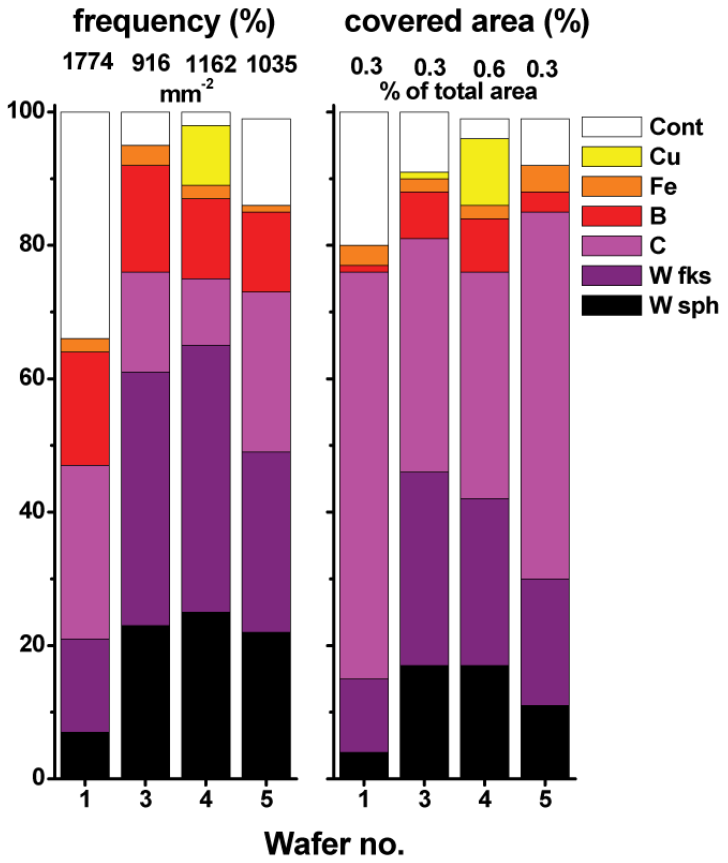
AUG: Review on dust investigations

- Si samples, automated SEM analysis
- Several 1000 particles at 5 locations over years





Rohde et al.,Phys.Scr., T136, (2009) 014024
Endstrasser et al., JNM, 415 (2011) S1085
Balden et al., NF, 54 (2014),073010

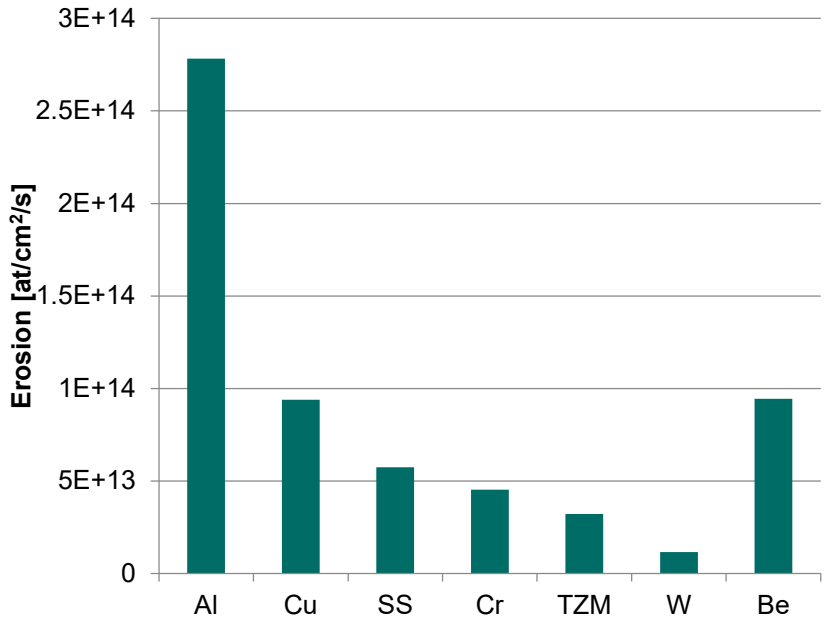
- Analysis by shape and EDX
- 90 % of dust descripted by 4 classes
- Results published 10 years ago
- No changes at AUG
- No analyses due to software and manpower issues

Focus on

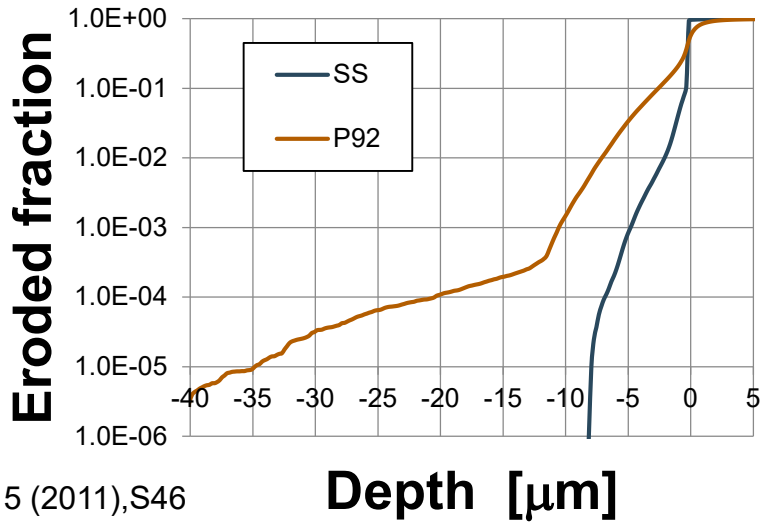
- **erosion by arcing**
- **New AUG samples**
- **Arc lab device**

W erosion by arcing: source of W spheroids ?

- Arcing is found in all devices
- Arcing is dominate erosion mechanism at some locations
- Use different materials to investigate arc erosion
- Inner baffle of AUG, deposits removed



- Magnetic steel shows higher erosion
- Deep holes (0.1. mm) found
- Modification of local magnetic field ?
- Needs more investigations…



Rohde et al., J.Nucl.Mat, 415 (2011),S46

Rohde et al., J.Nucl.Mat, 438 (2013),S800

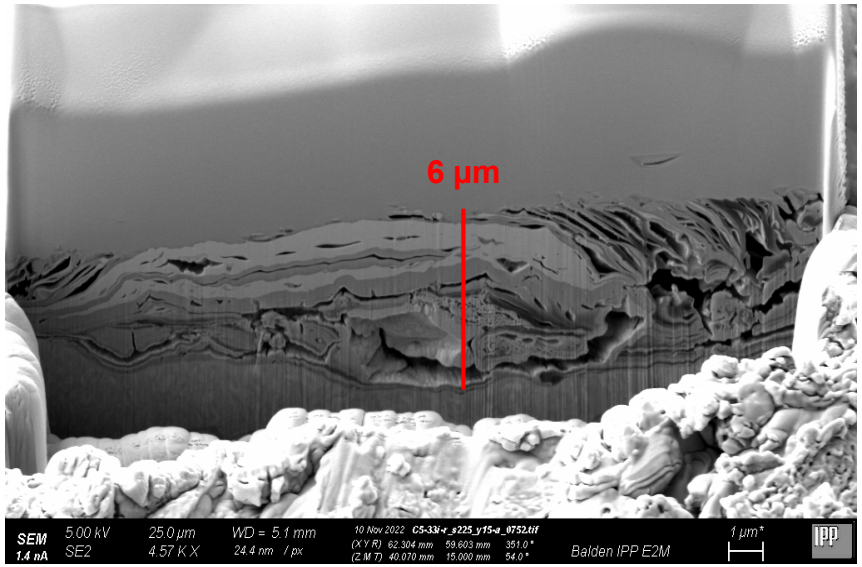
Rohde et al., NME, 9 (2016) 36

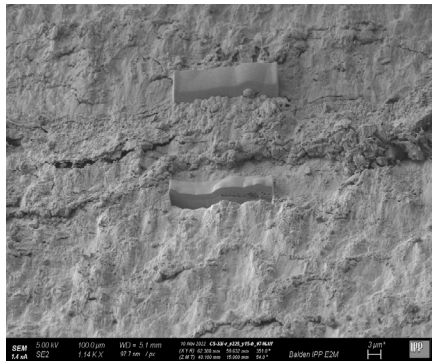
Rohde et al., NME 20 (2021) 101083

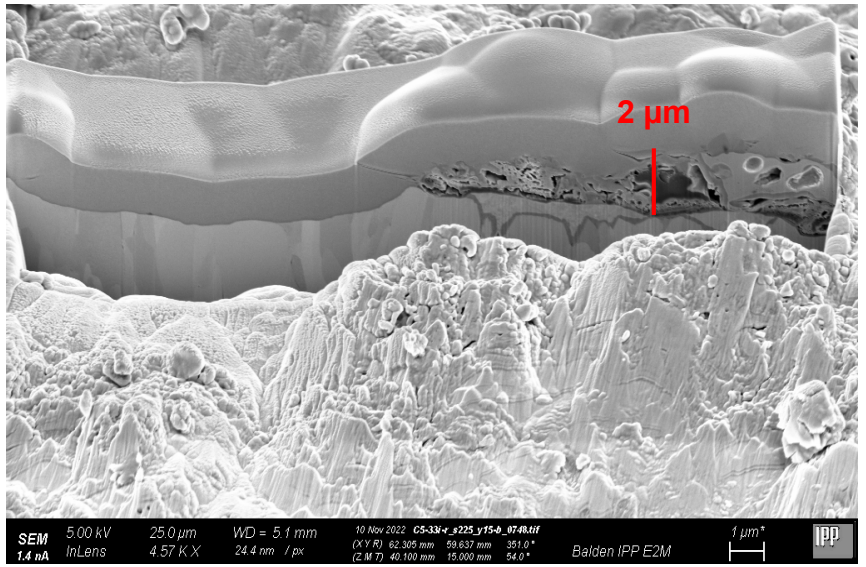
WEST: deposits at Divertor

- Divertor tiles investigated by IPP
- Thick deposits found

- Instable layer will flake off : dust production
- DITS plasmas where limited by C flaking







- Material mixture: D,B,C,W will react with water after vent > layer stability
- Is this relevant for Demo (material mix)?

- Other WEST data ?
- Contact Person at WEST ?

Extrapolation

- How get global results from localized measurements ?
- How to extrapolate to DEMO ?
  - Wall material needed
  - Production mechanism needed
    - Arcing: active area ?
    - Deposits: composition / stability ?
      (B layer water take up)
      much longer operation time
    - Local melting: overheat, run away…

Reported:

- AUG ~ 1 g / 5000 s
- JET ~ 0.2 g / 5000 s

- A reliable study requires:
  - Kind of dust production
  - Understanding of mechanism
  - Extrapolation to future device
- Beyond this task

To be done:

- Revisit old results
- Reactivation of software
- Discuss extrapolation techniques
- Get an idea of dust amounts (g or kg) ?