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Overview of Beryllium and Tungsten Dust Studies in JET with the ITER-Like Wall

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Processes of material migration, fuel retention and dust generation are key elements in studies of plasma-facing components (PFC) in the JET tokamak with ITER-Like Wall with beryllium limiters and tungsten divertor. Detailed determination of quantity, location, morphology and size of dust are carried out at JET to respond to the ITER needs for safety assessment and to provide input for modelers. The program comprises analyses of particles deposited directly on various erosion-deposition probes, collected by vacuum cleaning of the divertor and locally sampled from PFC with stickers. Two other strands dealing directly with safety aspects are: (a) deposition of mobile particles on the robotic boom used for all in-vessel operations and (b) the impact of moisture on flaking-off of co-deposits, i.e. dust generation following water leaks. The most important results are:
Total amount of dust collected by vacuum cleaning is about 1-2 g per campaign (19.5 -24.3 h plasma operation), i.e. over 100 times smaller than in JET operated with carbon walls.
Two major categories of Be dust are identified: flakes of co-deposits formed and droplets (2-10 ⊠m in diameter) or splashes originating from molten limiters.
Tungsten dust occurs mainly as flakes from W-coated tiles, while no droplets are found.
The areal density of dust particles sticking to monitors amounts to 300-400 mm-2.
On the boom one detects only very few particles connected with the tokamak operation (e.g. flakes of Be co-deposits), while the robotic operation on PFC results in dust generation.
Water ingress on hot surfaces with co-deposits (200 oC) causes thermo-mechanical stress leading to peeling-off of the layers.
Data have been transferred to modelers and areas of the greatest importance in dust generation and transport have been indicated. Details and consequences for a reactor operation will be discussed and further steps in the research program will be discussed.

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