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| **WPPWIE Deliverables Status Report** | | | | | **Date:** | | | 01-Aug-2022 | | |
| **Subproject:** | SP B / Experiments on erosion, deposition and material migration | | | | **Deliverable ID** | | | PWIE-SP B.1.T-T002-D004 | | |
| **Deliverable owner:** | F. Aumayr | | | | **Deliverable due date** | | | 31-12-2022 | | |
| **WP Leader:**  **SP Coordinator:** | S. Brezinsek (FZJ)  J.W. Coenen (FZJ) | | | |  | | |  | | |
| **Task title:** | SP B.1 Physics of erosion and deposition | | | | | | | | | |
| **Deliverable title:** | Effective sputtering yields of W model systems with varying morphologies and structures, including angular distributions of sputtered particles, and re-deposited W layers following exposure to controlled D and impurity ion beams (ÖAW) | | | | | | | | | |
| **Status:** |  | **Completed** |  | **Partially completed** | |  | **Delayed** | |  | **Cancelled** |
| Please write a short status report (max. ½ pages) here.  Please check the status of the deliverable(s) with a “x” in the row above.  If the deliverable(s) are delayed, please also indicate an estimated completion date in the report text.  If the deliverable(s) include machine time, please indicate the number of days that have been used for the deliverable(s) in the report text.  For reference, the specification of this task from the PMP is given below. | | | | | | | | | | |
| **Reference from PMP:** | | | | | | | | | | |
| The task will concentrate on broadening the understanding of physics behind erosion and (re-) deposition phenomena of plasma-facing materials and components in fusion-relevant conditions. To this end, experiments will be carried out in laboratory conditions and in linear plasma devices (MAGNUM-PSI, PSI-2, JULE-PSI, GyM) at varying plasma conditions including fluxes and fluence. The work will focus on assessing the erosion characteristics of different W-based materials and investigating the properties of re-deposited W with respect to bulk tungsten. Furthermore, physics questions related to arcing in material erosion and dust production will be experimentally addressed. Necessary materials for the implementation of the Task can be developed under SP B.4 and the obtained data will be used for benchmarking modelling efforts under SP D. Comparison with high-fluence exposures in tokamaks (WEST, AUG) will be carried out (with WPTE). | | | | | | | | | | |
| **Inputs required:**   * Samples for reference and model systems (in collaboration with SP A, SP B.4, SP C) * Plasma exposure parameters relevant for ITER and DEMO exposure conditions | | | | | | | | | | |
| **Tasks to be performed:**   * Determine the impact of plasma conditions on erosion of W model systems and formation of re-deposited layers: MAGNUM-PSI experiments and analyses (DIFFER) * Elucidate the sputtering properties of W model systems with varying morphologies in pure and mixed plasmas: GyM experiments and analyses (ENEA) * Assess the influence of evolving surface morphology on the sputtering properties of W model systems and formation of re-deposited layers: PSI-2 experiments and analyses. (SEM, LEIS, NRA, QMS) (FZJ) * Determine the sputtering properties, including angular distributions of sputtered particles, of W model systems with varying morphologies and structures as well as re-deposited W layers: laboratory experiments and analyses (ÖAW) * Characterize surface erosion induced by hypervelocity W dust impacts: dust-gun experiments and analyses (ENEA) * Investigate the formation and properties of W and Be dust produced in off-normal (air and water leaks) conditions in fusion reactors (IAP) * Perform ion-beam analyses for samples from dust studies and laboratory experiments (VR - jointly with ENEA and ÖAW) | | | | | | | | | | |
| **Deliverables:**   |  |  | | --- | --- | | **Deliverable ID:** | **Deliverable Title:** | | D001 | Erosion rates of W model systems and composition and structure of re-deposited layers in MAGNUM-PSI at varying plasma conditions (DIFFER) | | D002 | Effective sputtering yields of W model systems with varying morphologies in pure and mixed plasmas in GyM and by hypervelocity dust impacts (ENEA) | | D003 | Erosion rates and angular distribution of W model systems with varying morphologies as well as composition and structure of re-deposited layers in PSI-2 at varying plasma conditions (FZJ) | | D004 | Effective sputtering yields of W model systems with varying morphologies and structures, including angular distributions of sputtered particles, and re-deposited W layers following exposure to controlled D and impurity ion beams (ÖAW) | | D005 | Size distribution and composition of Be and W dust formed during air and water leaks (IAP) | | D006 | RBS, ERDA and MEIS/LEIS characterization of selected samples from laboratory erosion and dust experiments (VR) | | D007 | Erosion rates of W model systems and composition and structure of re-deposited layers in MAGNUM-PSI at varying plasma conditions (DIFFER) (Transfer 2021) | | | | | | | | | | | |
| **Management Information**  **Human Resources (2022):**   |  |  |  |  | | --- | --- | --- | --- | | **Deliverable Owner** | **Beneficiary** | **PM** | **Deliverable (Team)** | | T. Morgan | DIFFER | 4+4 | D001,D007 (S. Brons, W. Melissen, T. Morgan, B. Tyburska-Pueschel) | | A. Uccello | ENEA | 4 | D002 (G. Alberti, M. De Angeli, A. Cremona, D. Dellasega, F. Ghezzi, M. Passoni, M. Pedroni, D. Ripamonti, A. Uccello) | | O. Marchuk | FZJ | 7 | D003 (P. Bittner, R. Koslowski, A. Kreter, O. Marchuk, M. Rasinski, M. Sackers) | | F. Aumayr | ÖAW | 5 | D004 (F. Aumayr, C. Cupak, P. Szabo) | | C. Lungu | IAP | 2 | D005 (T. Acsente, B. Butoi, G. Dinescu, P. Dinca, C. Lungu, C. Porosnicu, V. Satulu, C. Stancu) | | D. Primetzhofer | VR | 3 | D006 (L. Dittrich, M. Moro, P. Petersson, D. Primetzhofer, M. Rubel, J. Shams-Latifi, P. Ström) | | **Total** |  | **29** |  |   **Machine Resources (2022):**   |  |  |  |  | | --- | --- | --- | --- | | **Device** | **Beneficiary** | **Days** | **Related Deliverable** | | MAGNUM-PSI | DIFFER | 5+4 | D001, D007 | | GYM | ENEA | 20 | D002 | | PSI-2 | FZJ | 15 | D003 | | Accelerator | DIFFER | 3+3 | D001, D007 | | Accelerator | FZJ | 3 | D003 | | Accelerator | VR | 5 | D006 | |  |  |  |  |   **Other resources:**  **Collaborations:**   * WPMAT, WPDIV, WPTE * ITPA DivSOL   **Other information:**   * Connected to TSVVs associated with WPPWIE and linked to ENR project VR | | | | | | | | | | |