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Dynamics of tungsten erosion under ELM-like intense heat loads

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Simulations of transient heat load corresponding to unmitigated ELMs type I in ITER divertor are performed on novel material test facility developed at the Budker Institute of Nuclear Physics. Employing of intense long pulse (0.1-0.3 ms) electron beam as a heating source results in relative low light emission by the ablation plume hence facilitates imaging of the tungsten target during the entire heating process. Fast CCD cameras with minimal exposure time of 7 μ s are capable of producing a few 1.4 megapixel images in near infrared range during a single heating pulse. Crack formation is observed at the heat level near the tungsten melting threshold. At heat load well above the melting threshold the spatial structure and temporal behavior of melt layer is imaged during the heating and cooling phases. Visualization with CCD cameras of droplets ejected by the tungsten melt layer detects fast particles with velocities of several hundred of m/s. We apply also scattering of continuous wave laser (532 nm, 0.8 W) light for observation of dynamics of dust particles in the size range of 2-30 μ m ejected from the tungsten surface by the impact of transient heat load.

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