Thermal behavior of a VPS-W/Cu limiter exposed to HT-7 long pulse plasmas

Q. Li, G.-N. Luo, P. Qi, Z.S. Yang, L. Wang and Z.H. Qian
Institute of Plasma Physics, Chinese Academy of Sciences, P.O. Box 1126, 230031 Hefei, Anhui, China
liqiang577@ipp.ac.cn

Thick tungsten (W) coatings prepared by vacuum plasma spraying (VPS) on copper (Cu) substrate is one of important potential materials for plasma facing components (PFCs) in future tokamaks. In order to investigate the thermal behavior of the coatings under high heat fluxes, W coatings of ~1 mm thick were deposited onto a directly cooled, movable Cu limiter. And the limiter has then been tested using an e-beam high heat flux (HHF) device and also exposing to HT-7 long pulse plasmas. The limiter can withstand the e-beam irradiation of >20 cycles at duration of 100 s/cycle and heat load of ~10 MW/m². The limiter was exposed to 1 minute plasmas with LHCD power of 130 kW in HT-7 where the surface and bulk temperatures were monitored employing an IR camera and thermocouples, respectively. The heat flux deposited onto the limiter was evaluated using an ANSYS code using the measured surface temperatures as boundary conditions and the heat fluxes have been calculated to be 5-7 MW/m². And the calculated temperature distribution/evolution inside the limiter have also been compared with those measured by the thermocouples. Results from the coming HT-7 campaigns will also be presented on the conference.

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