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EX/P5-32: Control of Dust Flux in LHD and in a Divertor Simulator

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Much attention has recently directed to the study of dust in fusion devices mainly because dust can pose safety issues related to its chemical activity, tritium retention and radioactive content [1]. Therefore, it is important to invent a dust removal method. Effects of a local bias potential on the flux of dust particles have been studied by dust collections in a divertor simu-lator [2]. The collected dust particles can be classified into three kinds: spherical particles, agglomerates, and flakes. Spherical dust particles are below about 500 nm in size. Agglomer-ates are 50-600 nm in size and composed of small spherical primary particles of around 10 nm in size. Flakes have the size above 1 μm and are irregular in shape. The spherical dust flux increases exponentially by 2 orders of magnitude with increasing the local bias potential from negative to positive, while the fluxes of agglomerates and flakes are irrelevant to the bias voltages. Based on the results for spherical dust particles, the effect of local bias potential on the dust removal in fusion devices has been studied by dust collection experiment in the LHD. The major composition of the dust particles is carbon, which is the primary component of the divertor plates in LHD (IG-430), whereas flakes contain Fe and Cr, which are the main com-ponents of its first wall (SS316). Agglomerates in LHD are rare. The particle and mass fluxes of carbon and metal dust collected on the substrates increases exponentially by 1-1.5 orders of magnitude with increasing the local bias potential. The results indicate that collection of dust flux using the local biasing is useful to remove dust particles at the shadow area in fusion de-vices.
[1] S. I. Krasheninnikov, et al., Plasma Phys. Control. Fus. 50 (2008) 124054.
[2] S. Iwashita, et al., J. Plasma Fusion Res. SERIES 8 (2009) 308.

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