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 develop a dust removal method. In a preceding study, it has been found that a positively-biased local potential wall removes the most of particles formed in the processing plasmas [2]. The results motivate us to study the collection of dust particles in fusion devices using the local bias potential. Here we report experimental results of dust collection in a divertor simulator and the Large Helical Device (LHD) in the National Institute of Fusion Science using biased substrates as a first step to realize a novel dust removal method for fusion reactor utilizing the local bias potential.

Dust collection in the divertor simulator was carried out using helicon H2 discharge plasmas [3]. Dust particles were produced due to interactions between a graphite target and the plasmas. They were collected on DC biased Si substrates of 15x10 mm² which were set at 110 mm below the graphite target. The collected dust particles can be classified into three kinds: spherical particles, agglomerates, and flakes [3, 4]. The major composition of the dust particles collected is carbon, which is the primary component of the graphite target. We have obtained dependence of particle fluxes of dust towards the biased substrates on the potential difference $\Delta \phi$ between bias voltage $V_{bias}$ and space potential $V_s$. The spherical dust flux increases exponentially by 2 orders of magnitude with increasing $\Delta \phi$ from -80 V to +20 V, while the fluxes of agglomerates and flakes are irrelevant to the bias voltages. These results suggest transport mechanisms of agglomerates and flakes are different from that of spherical dust particles. The results of spherical dust particles motivate us to carry out collection of dust particles in LHD using local bias potential.

Dust collection in LHD was conducted using DC biased Si substrates located at a bottom first wall during a total discharging period of 920 s of H2 and He main discharges (the 15th campaign on 11th and 12th August, 2011). The mean size and size distribution of dust particles in LHD is similar to that in the divertor simulator. 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 components of its first wall (SS316). Figure 1(a) and 1(b) show dependences of particle and mass fluxes of dust on $\Delta \phi$. The spherical dust flux increases exponentially by 1.5 orders of magnitude with increasing $\Delta \phi$ from -80 V to +20 V, while the fluxes of agglomerates and flakes are irrelevant to the bias voltages. These results suggest transport mechanisms of agglomerates and flakes are different from that of spherical dust particles. The results of spherical dust particles motivate us to carry out collection of dust particles in LHD using local bias potential.

In conclusion, flux control of dust particles using local bias potential is useful to remove carbon and metal dust particles at the shadow area in fusion devices while the collection efficiency depends on the shape or size of dust particles.

**Fig. 1.** Dependence of (a) particle flux and (b) mass flux of dust collected in the LHD on the potential difference $\Delta \phi$ between bias voltage $V_{bias}$ and space potential $V_s$.