## §27. Ejection of Pre-characterized Carbon Dust in LHD (2)

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Dust ejection experiments are considered as a demonstration of moving dust particles reduced by chemical reactions and erosions from divertor targets. It is also an effective method to investigate a lifetime of dust particles. An initial position, a material composition and a diameter of dust particles are kwon and these dust particles interact with similar histories of plasma conditions, such as electron temperatures, on the way of their moving process. Dust ejection experiment was started using DiMOS in DIII-D and this result shows a useful method to understand dust dynamics.

We have three kinds of spherical glassy carbon dust of 8, 60, 120 microns, and these are the commercial size made by Tokai Carbon Co., LTD. A typical diameter of 'natural' carbon dust in LHD is under 1 micron of carbon. In this experiment, different diameters of dust particles, 8 micron and 120 micron are used. These carbon dust particles are set on the same dust holder made by stainless steal and an initial amount of carbon dust particles is about 2.0 g per each measured by microbalance. This dust sample holder is installed on the head of the movable material probe, which locates at the lower port in LHD and a dust sample holder with dust particles is set the position of divertor leg plasma before the plasma discharge. Two kinds of area were separated by stainless steel plate and dust exposed area to divertor plasma was controlled by rotation angle of the movable material probe. And then each type of carbon dust was ejected at different plasma discharges.

Figure 1 shows CAD image of field of view from high speed camera at the upper port to the head of material probe system in LHD. Using this camera installation, dust movement was measured as shown in Figs.2. The case of 120 micron, dust particles can be observed as separated particles. For discussion about movements of dust particles, large particles are easier than small one.

Movements of pre-characterized dusts ejected in the divertor plasma were observed by using high speed camera in LHD. For 8 micron particles, Direction of motion of dust particles is limited. Many dust particles are moving nearly unidirectionally with no acceleration. Typical illumination time is less than 5 ms and the velocity is up to 40 m/s. Conglomerates of dust particles with large diameters are observed and these conglomerates have ablation clouds with changing speeds and a long illumination time of 10-20 ms. For 120 micron particles, typical illumination time is from 5 to 10 ms and the velocities are less than 10 m/s .

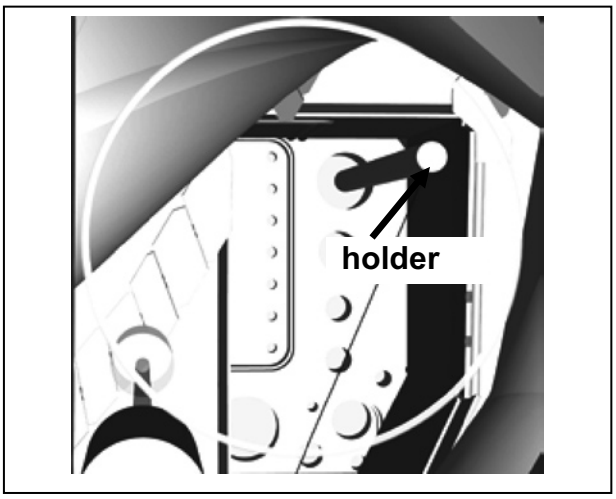
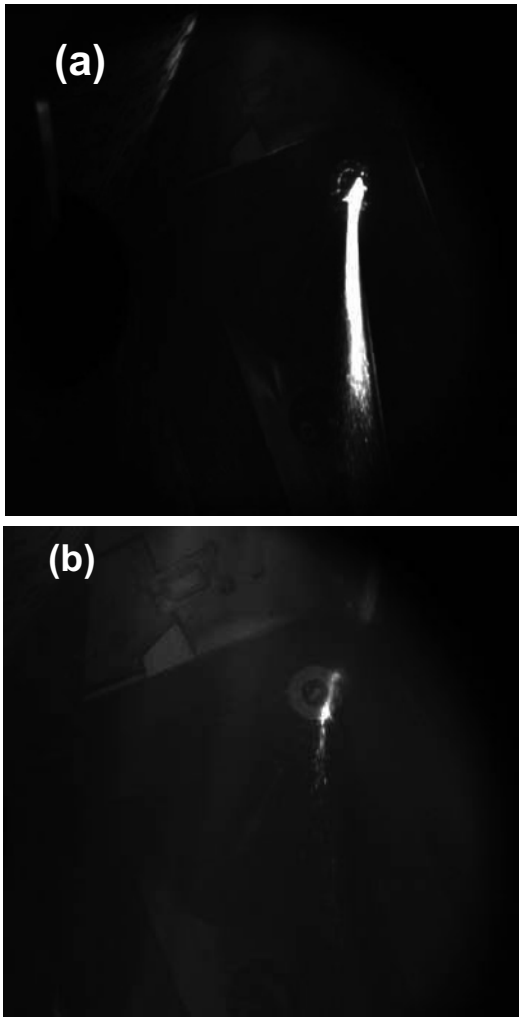



Fig.1 CAD image of field of view from high speed camera at the upper port to the head of material probe system in LHD.




Figs.2 (a) Image of dust movement by high-speed camera using spherical glassy carbon dusts of (a) 8 micron and (b) 120 micron.