

## Group motion of heteromorphic fine particles in HF discharge plasma

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Related with complex systems, fine-particle plasmas have much attention to scientists and engineers [1, 2]. Hence, we are trying to make fine-particle plasmas with heteromorphic particle distributions by using a high-frequency (HF) Ar plasma. And the motions of charged particles are observed. In a stainless steel chamber (150 mm in diam, 150 mmh), 100 mm in diam disk electrodes and a 80 mm in diam metal ring are set. In this experiment, HF argon discharge is produced at  $10^{-13}$  Pa by applying HF voltage of about 270~290  $V_{rms}$  to the lower disk-electrode with respect to the upper grounded disk-electrode. And a ring is added on the lower electrode to confine fine-particles. The particles used are silicon carbide, which has diameter of about 8  $\mu$ m, or silicon-nitride (about 8  $\mu$ m), or short hemp (about 25  $\mu$ m diam.  $10 \sim 1500$   $\mu$ m long). They are injected from a dust dropper. A digital microscope camera (SELMIC LWD100) and a CCD video camera are used to investigate the particle behaviors. Under a condition of discharge voltage  $V_d = 280 V_{rms}$ , discharge current  $I_d = 0.2 A_{rms}$  and pressure  $p(\text{Ar}) = 13$  Pa, a disk-shaped cloud is generated as shown in Fig. 1. Each particle motion and the particle-group motion are recorded by the cameras. We could observe planet-like motions like Fig. 2 (track of a SiC particle). In case of the short hemp, there are spin motions and planet-like motions. We conjecture that these motions are activated by the dust-acoustic perturbation.

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[2] H. Thomas, G.E. Morfill, V. Demmel, Phys. Rev. Lett. 73 (1994) 652.

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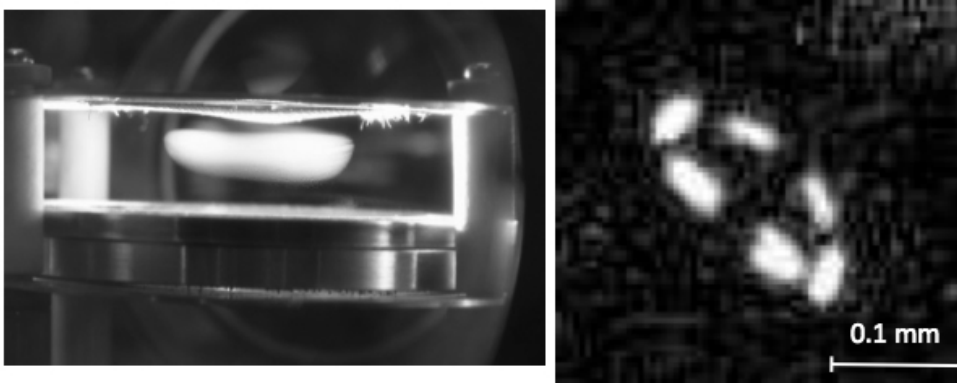


Fig. 1 Fine particles in the HF plasma. Fig. 2 Planet-like motion of a particle.