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ELECTROPHORETIC LEVITATION MODEL OF THIN CLEANING TECHNOLOGY

The thin dust cleaning of particles with a complex morphology surface is faced with the problem of the non-uniform distribution of the applied field near the dielectric surface. The effect of the mechanism of the formation of dielectric current dust fluxes meets the factor of non-uniform conditions for particles starting from surfaces.

In this paper, an approach is proposed to eliminate these complexities by forming a levitation layer of dust particles ahead of the dynamic stage of the electrophoretic process. There are discussed ways of reducing the operating voltage, approximating the technology of the proposed fine dust treatment to real industrial technology. Levitation criteria which corresponds to particular stream dynamics has been theoretically discussed and recommended to be experimentally checked.

The phenomena has been studied experimentally in forms of horizontal liquid drop stream injected from capillary tube and vertical granular cluster jet both subjected into gravity in the presence of inhomogeneous electric field. In both experiments, we observe existence of stream velocities saturation effects, which reflect the balance between the inertia (gravity) effects and electrophoretic effects due to external electric field inhomogeneity.

We too we propose theoretical di-electrophoretic mechanism of the discovered effect that happens to be enough to describe the observed motion in the different kinetic stages.

We indicate a numerous practical applications of the discovered effects (for instance under low gravity conditions). Due to possibility of manipulation by parameters of motion of the liquid droplets and granular beads subject to external inhomogeneous electric field in particular into such undertakings as area of manipulation and evacuation by medium- and fine-size dust conglomerations, and different areas of electrophoretic and di-electrophoretic technologies the topic of research is quite actual.

References

1. Gerasymov O., Aliotta F., Vasi C., Chernilevska I. Liquid and granular streams, manipulated by external inhomogeneous electric field // P. 103. In: Abstracts of 8th International Conference “Physics of Liquid Matter: Modern Problems” (PLMMP-2018), 18-22 May 2018, Taras Shevchenko National University of Kyiv, Ukraine.

2. Gerasymov O.I., Aliotta F., Vasi C., Chernilevska I.A. Universal micro-particle dynamics in non-uniform electric fields (from liquid to granular jet) // 6th International Conference "Nanotechnologies and Nanomaterials" (NANO-2018), 27-30 August 2018, Institute of Physics, Kyiv, Ukraine.