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Modeling of Dust Dynamics in Tokamaks[1] R.D. SMIRNOV, A. YU. RIGAROV, S.I. KRASHENINNIKOV, M. ROSENBERG, D.A. MENDIS, UCSD — The experimentally proved presence of dust in fusion devices is a recognized issue that may have large impact on tokamak operation and can present safety threat for fusion energy. In this work, transport and distribution of dust particles in tokamaks are studied using computer simulations with the dust transport DUSTT code. Recent developments of the DUSTT code are reported. The improved model accounts for thermionic and secondary electron emission; heat fluxes on the dust are refined using the Orbital Motion Limited theory; corrections for small body thermal radiation and dust-impurity interaction are also introduced. The effect of these processes on dust dynamics is evaluated. Reproducing of experimentally obtained dust tracks in NSTX tokamak allows tuning and verification of the code. Statistical averaging over ensemble of dust trajectories is used to obtain volume distributions of dust characteristics. It is predicted that transport of dust accompanied with ablation can cause significantly enhanced penetration of impurities toward the core in comparison with impurity ion transport. As shown, collisions of the dust particles with walls are critical for dust transport due to loss of kinetic energy and mass. It is shown that dust can experience net mass deposition in relatively cold contaminated plasma regions.

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