

ON THE ROLE OF ELECTRON QUANTUM
TUNNELING IN CHARGING OF DUST
GRAINS IN COMPLEX PLASMA

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S u m m a r y

The role of the quantum tunneling effect in the electron accretion current onto a negatively charged grain immersed in isotropic plasma is analyzed, within the quasiclassic approximation, for different plasma electron distribution functions, plasma parameters, and grain sizes. It is shown that the contribution of the quantum tunneling into the grain charging is small (negligible) for relatively large (micron-sized) dust grains in plasmas with electron temperatures of the order of a few eV, but becomes important for nano-sized dust grains (tens to hundreds nm in diameter) in cold and ultracold plasmas (electron temperatures \sim tens to hundreds of Kelvin degrees), especially in plasmas with depleted high-energy “tails” in the electron energy distribution.