Charge Fluctuations of small Particles

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The charge distribution of small particle and in particular for particle less than 10 nm is critical for aerosol dynamics while it controls particle coagulation [1] . Particle charge distribution is well described by Gaussian distribution [2] but this assumption is no more valid for such small particle. In this study we developed a Fokker Planck method using Monte Carlo simulation to describe the charge state of particle in a plasma.

The model captures gaussian distribution for large particle. However for small particle sizes the distribution is very narrow, large fraction of them are neutrals [3] and cannot be described by a gaussian.

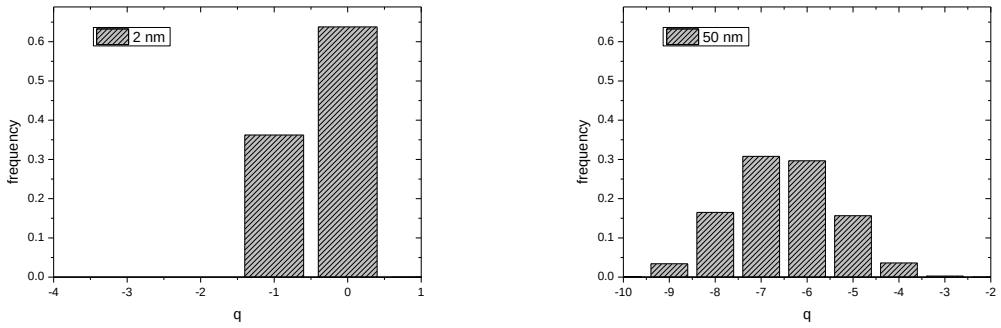

Figure 1 : charge distribution for ne=ni, Te/Ti=3 for two particle size.

This charge fluctuation effect has been studied for different plasma conditions and has to be taken into account when considering for coagulation in dusty plasmas.

1. Michau, A., C. Arnas, and K. Hassouni, *Aerosol dynamics in a sputtering DC discharge.* Journal of Applied Physics, 2017. **121**(16): p. 163301.
2. Matsoukas, T. and S.K. Friedlander, *Dynamics of aerosol agglomerate formation.* Journal of Colloid and Interface Science, 1991. **146**(2): p. 495-506.
3. Bouchoule, *Dusty plasmas: physics, chemistry & technological impacts in plasma processing* 1999: John Wiley and Sons Ltd.