

Measurement of the low energy electron sticking coefficients using dusty plasmas

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In the dusty plasma community, there is extensive discourse on the charging properties exhibited by various materials. These properties directly correlate with the electron sticking coefficient of particles, a factor of significant importance in plasma technology due to its influence on the discharge characteristics of RF-driven plasma reactors utilizing different electrode materials. Precise measurement of dust charge presents an opportunity for a novel approach to determine low-energy electron sticking coefficients.

Over recent years, we have developed a suite of diagnostic tools tailored for high-precision measurement of both the charge-to-mass ratio and size of dust particles [1,2] within plasma sheaths. Using these methodologies, we can accurately ascertain particle charge, enabling the measurement of electron sticking coefficients at exceedingly low electron impact energies (below 10 eV). Notably, our proposed method offers advantages over alternative approaches. It allows for the measurement of the entire charge of small solids within a plasma, circumventing issues arising from charge diffusion on large solid surfaces that could obscure measurements. Additionally, our method is not contingent upon material electric conductivity, thus enabling investigation of both conductive and dielectric materials.

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References

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