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The Effective Temperature of Dust Impact Plasmas — Olivine Dust on Tungsten Target

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We experimentally observe both positive and negative charge carriers in impact plasma and estimate their effective temperatures. The measurements are carried on a dust accelerator using polypyrrole (PPy)-coated olivine dust particles impacting tungsten (W) target in the velocity range of 2–18 km/s. We measure the retained impact charge as a function of applied bias potential to the control grid. The temperatures are estimated from the data fit. The estimated effective temperatures of the positive ions are approximately 7 eV and seems to be independent of the impact speed. The negative charge carriers' temperatures vary from as low as 1 eV for the lowest speeds to almost ten times higher speeds. The presented values differ significantly from previous studies using Fe dust particles. Yet, the discrepancy can be attributed to a larger fraction of negative ions in the impact plasma that likely originates from the PPy coating.