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Dust charge reversal in an afterglow plasma[1] NEERAJ CHAUBEY, JOHN GOREE, Univ. of Iowa — Dusty plasmas contain small particles of solid matter, which are usually charged negatively. However, we have discovered a condition where the polarity reverses. Although they are negatively charged while the plasma is powered steadily, the particles switch polarity and gain a large positive charge a few msec after switching off the plasma power. In the afterglow, electrons are largely absent, and ions collect on the particle, giving it a positive charge. This discovery was made using a radiofrequency glow-discharge plasma. Polymer microspheres, of 8.7-micron diameter, were levitated in a horizontal sheath above a lower electrode powered at 13 MHz. Due to capacitive coupling, the lower electrode sustained a negative potential, even after the RF power was extinguished. Viewing from the side, while suddenly switching off the RF power, we observed the particles fall. They had a constant acceleration greater than that of gravity alone. This increased acceleration can only be explained if the dust particles acquire positive charges in the first few msec of their fall, so that they are accelerated toward the negatively biased electrode.

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