

PZT sensor with current-to-voltage converting amplifier for dust observation

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This paper describes the concept of a dust monitor with a large detection area but less resource consumption using lead zirconate titanate (PZT) ceramics, and the possibility is experimentally demonstrated. PZT sensors, which are traditional devices for in-situ observation of hypervelocity dust particles, have been used for momentum measurement. The hypervelocity impact signals of PZT sensors are typically read by charge-sensitive amplifiers. Instead, we suggested the use of a current-to-voltage converting amplifier for interpreting the impact signal of a PZT sensor to determine the size of a dust particle down to 0.5 μm in radius. If a sufficient number of such PZT sensors cover the interspaces of instruments on interplanetary-space-cruising spacecraft, datasets of dust impacts can be obtained with higher statistical precision than that of previous observations. Such observations can provide insights into unresolved science problems in interplanetary dust research.

Keywords: cosmic dust observation, piezoelectric PZT, current to voltage conversion amplifier