Requests for Collaboration

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Research Interests

- Particle detector using lead zirconate titanate

Creative Achievements in The Application of New and Existing Science and Technology

The detector made of lead zirconate titanate (PZT) can be expected to operate without a power supply because of its piezoelectricity. Moreover, PZT can easily be formed into arbitrary shapes. These properties are considered to be more advantageous under certain conditions such as limited electric power and space.

(1) *Cosmic dust detector*:

A response of the PZT detector was studied by ground-based laboratory impact experiments using hypervelocity microparticles supplied by a Van de Graaff accelerator [1]. The output waveform obtained from the detector was found to be dependent on the particle's impact velocity. PZT is to be used as a cosmic dust detector for installation on a satellite [2].

(2) *Radiation detector*:

The characteristics of the PZT detector have been studied using a 400 MeV/n xenon (Xe) beam. The following two methods were taken to evaluate performance of the detector. One was an indirect method; a liquid is excited by the Xe beam and the pressure wave generated is measured using the PZT detector set in the liquid [3]. The other method was a direct method; the PZT detector is directly irradiated by the beam and the electric signal generated on the PZT is monitored [4]. In addition, the resonant and antiresonant frequencies of the PZT detector have been measured [5]. These results obtained so far suggest that PZT can be applied to radiation detector.

Research theme that I want to Collaborate

- Measurement technique utilizing piezoelectric effect

A List of 5 Key Publications

[1] Laboratory calibration measurements of a piezoelectric lead zirconate titanate cosmic dust detector at low velocities, S. Takechi, K. Nogami, T. Miyachi, M. Fujii, N. Hasebe, T. Iwai, S. Sasaki, H. Ohashi, H. Shibata, E. Grün, R. Srama, N. Okada, ***Adv. Space Res. 43,*** 905-909 (2009).

[2] Development of the Mercury dust monitor (MDM) on board the BepiColombo mission, K. Nogami, M. Fujii, H. Ohashi, T. Miyachi, S. Sasaki, S. Hasegawa, H. Yano, H. Shibata, T. Iwai, S. Minami, S. Takechi, E. Grün, R. Srama, ***Planet. Space Sci. 58,*** 108-115 (2010).

[3] Radiation detector based on piezoelectric lead zirconate titanate material, S. Takechi, T. Miyachi, M. Fujii, N. Hasebe, K. Mori, H. Shibata, T. Murakami, Y. Uchihori, N. Okada, ***Nucl. Instrum. Methods Phys. Res., Sect. A 586,*** 309-313 (2008).

[4] Research on output signal of piezoelectric lead zirconate titanate detector using Monte Carlo method, S. Takechi, T. Mitsuhashi, Y. Miura, T. Miyachi, M. Kobayashi, O. Okudaira, H. Shibata, M. Fujii, N. Okada, T. Murakami, Y. Uchihori, ***Nucl. Instrum. Methods Phys. Res., Sect. A 858,*** 69-72 (2017).

[5] Variation in resonant frequency of piezoelectric lead-zirconate-titanate element undergoing high-level radiation, M. Kobayashi, T. Miyachi, S. Takechi, T. Mitsuhashi, Y. Miura, H. Shibata, N. Okada, M. Hattori, O. Okudaira, M. Fujii, T. Murakami, Y. Uchihori, ***Jpn. J. Appl. Phys. 53,*** 066602 (2014).