A Low Frequency Piezoelectric Actuator for Particle Manipulation

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Abstract

A low frequency piezoelectric actuator is developed for noncontact trapping, screening and transportation of small particles. In this actuator, two metal plates clamp a multilayer piezoelectric vibrator by a small bolt, and the metal plates are tapered in their lower parts so that a vibration gradient can be obtained. The flexural vibration of the metal plates is used to generate a sound field in the gap between the two metal plates. At a driving frequency about 152.8kHz, small particles which have an average diameter from several tens μm to several hundreds μm, can be trapped stably without contact with the actuator, and the particles insoluble in water can be transported in water by the actuator. In the noncontact trapping of small particles, the relationship among the number of trapped particles, vibration velocity and input power are clarified. In the particle transportation, the dependence of the particle loss during the transportation on the transportation distance and the input power is estimated.

Keywords: piezoelectric actuator, standing wave ultrasound, particle manipulation

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