

Study on Three-Dimensional Microstructures Fabricated by Using Synchrotron Radiation

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The demand of fabrication of three-dimensional microstructures which have a free-form surface and a sidewall inclination are increasing for the advancement of MEMS (Micro Electro Mechanical Systems). In order to aim at realization of this demand, this paper is reported the research of fabrication technology of the three-dimensional microstructures which used SR (Synchrotron Radiation) light. In this research, the three-dimensional structures which have a free-form were fabricated by the X-ray lithography. And, the new three-dimensional fabrication method was proposed in consideration of the problems of the conventional technology. Moreover, it focus attention on PTFE (Polytetrafluoroethylene) which is one of fluoroplastic group with excellent material characteristics, three-dimensional PTFE microstructures is fabricated by using SR ablation.

This thesis is comprised of 6 chapters. In Chapter 1, the background and the purpose, and outline of this research are described. In Chapter 2, it's intended that realization of high accuracy microfabrication technology using the X-ray lithography by SR light, it detailed study of fabrication and mechanism of X-ray lithography technology. In Chapter 3, three-dimensional microstructures with free-form surface or a sidewall inclination are fabricated by using the PCT (Plain-pattern to Cross-section Transfer) method which is one of the three-dimensional fabrication methods. And, it detailed study of the factor used as a form error, and study about corrective strategies. In Chapter 4, the new three-dimensional fabrication method was proposed. It carried out the basic experiment towards realization of the new fabrication method, and it possible to fabricate arbitrary three-dimensional structures finally. In Chapter 5, three-dimensional PTFE microstructures are fabricated by using SR ablation. And, it study about form error factor, and shape-prediction. The final chapter summarizes this thesis.