

**Combinatorial Search and Nanoprocessing of
Pt-free Amorphous Alloys for Glass Molding Die**

Seiichi Hata

(Tokyo Institute of Technology, Precision and Intelligence Laboratory, Associate Professor)

【Outline of survey】

In the production of micro and high-performance glass aspheric lenses with diffraction gratings, the process of molding the glass is critical. However, conventional molding die materials for glass lenses (WC or SiC) are sintered materials. It is difficult to produce diffraction gratings on them. In addition, a protective film of noble metal such as Pt alloy must be deposited on the die surface in order to prevent oxidation and fusion with the molten glass. This film blurs the edges of the gratings. The blurred edges degrade the optical performance of the molded lens. Industry has long desired a molding die material that is robust and that has a heat resistance comparable to those of conventional materials, that allows high-precision processing, and that requires no protective film.

The object of this project is to find a novel Pt-free amorphous alloy for the molding die and to perform high-precision fine processing (nanoprocessing) on the alloy. For creation and systematic search for a large number of alloy samples, combinatorial search is employed. Efficient search for the alloy and its nanoprocessing are realized by new combinatorial measurement method for the crystallization temperature of the amorphous alloys and new nanoprocessing that is not only diamond turning but also forming.

【Expected results】

This project will lead into miniaturizing and improving the performance of almost any optical glass component including lenses by realization of glass molding die with microstructures such as diffraction gratings made of the novel Pt-free amorphous alloy. The new combinatorial measurement methods and nanoprocessing methods are promising for a wide variety of technology field

【References by the principal investigator】

- Seiichi HATA, Junpei SAKURAI and Akira SHIMOKOHBE, Experimental fabrication of glass lens molding die made of novel Pt based amorphous alloy, Trans. Jpn. Soc. Mech. Eng C, 74, [740] 1020-1025 (2008)
- Seiichi HATA, Ryusuke YAMAUCHI, Junpei SAKURAI and Akira SHIMOKOHBE, Combinatorial Arc Plasma Deposition of Thin Films, Jpn. J. Appl. Phys., 45, [4A] 2708-2713 (2006)

【Term of project】 FY2008—2012

【Budget allocation】

82,100,000 yen (direct cost)

【Homepage address】

<http://www.nano.pi.titech.ac.jp/hata-index.htm>