

# Wavefront control element and diffraction grating

Manufacture small structure in short time by controlling the metallic glass material shape

## Summary

In X-ray and neutron interferometry, the wavefront control elements must be precisely shaped. Grating with high-precision shape is required especially for interferometer where metallic glass grating is used as wavefront control elements. To obtain a metallic glass grating, it is preferable to bring the grating as close as possible to the crystallization initiation temperature with fast heat-up. However, more the temperature is high, more the lifetime time for the supercooled liquid is short. Therefore, the metallic glass material has to be molded while the viscosity is still high. In addition, the conventional grating manufacturing has difficulty to obtain small structures and the process needs long time.

This invention is able to form a metallic glass material with low viscosity, and to provide a manufacturing method, wavefront-controlled elements and diffraction grating with structure smaller than few  $10\mu\text{m}$  having precise shape control in a short time. This invention has a process of heating a metallic glass material in a supercooled state to a temperature above the crystallization begins, and mixing until the crystallization is completed.

## Effect

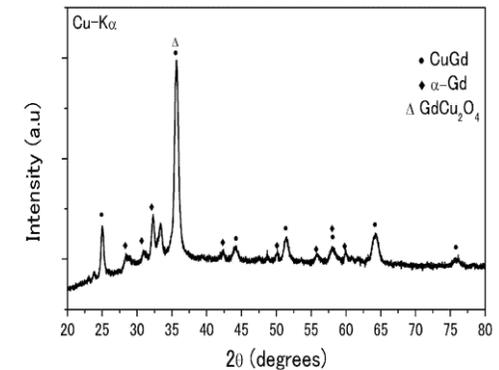
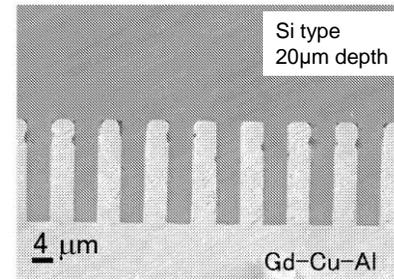
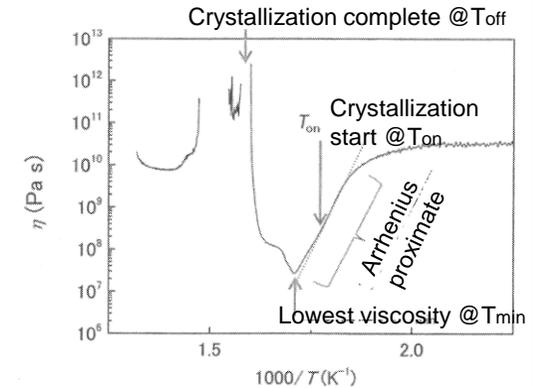
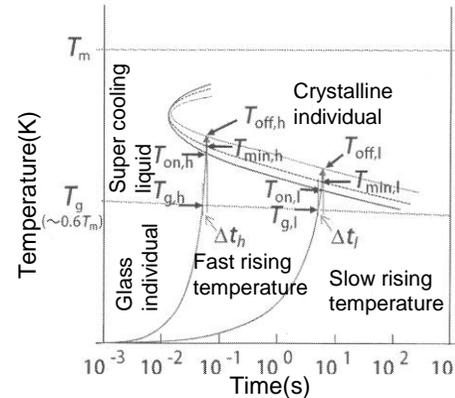
Able to control shape precisely and to produce small structures of less than few  $10\mu\text{m}$  in a short time

## Application

- X-ray / neutron Talbot interferometry

## Patent Data Sheet

Patent number: German patent 602016026590.7  
 US patent publication 2018-0187294  
 WO2016/208517 (T15-001)  
 Inventors: KATO Hidemi, YASHIRO Wataru



- 【Up left】Relationship between the metallic glass materials state and the temperature heating time
- 【Up right】Temperature dependency of metallic glass materials viscosity during temperature rise
- 【Down left】Diffraction grating manufacturing results
- 【Down right】X-ray diffraction results of the manufactured grating

## Contact

Tohoku Techno Arch Co., LTD  
 TEL:+81-22-222-3049, FAX:+81-22-222-3419  
[Click](#) to contact