



The Japan Society for Precision Engineering

Introduction of JSPE Numata Memorial Paper Awards 2019

1. Production of glass optical devices by three-dimensional laser slicing

Tatsuki ABE, Yohei YAMADA, Junichi IKENO, and Hideki SUZUKI

J. JSPE, Vol. 85, No. 5, pp. 426-431

Aspheric lenses are used in various optical instruments. However, it has a complicated surface shape and is difficult to be processed. Therefore, in this research, we tried to develop a processing method that produces a lens directly from glass using laser. A laser slicing process is performed using an ultrashort pulse laser having transparency to glass. When a continuous process-affected layer is formed inside by the laser, a crack propagates in the process-affected layer, and then, the glass is peeled off with mirror surface. As a result, three-dimensional processing is realized by forming a process-affected layer three-dimensionally. It was also found that the process-affected layer can be removed by annealing.

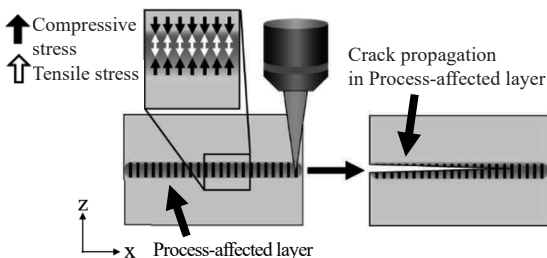


Fig. 1. Mechanism of slicing by crack propagation in process-affected layer.

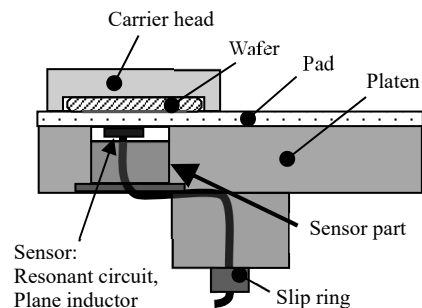
2. Development of endpoint detection using optical transmittance and magnetic permeability based on skin effect in chemical mechanical planarization

Takashi FUJITA and Keita KITADE

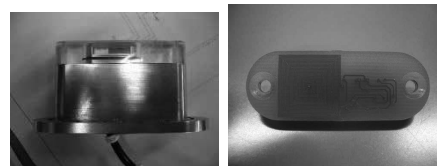
Precision Engineering, Vol. 57, pp. 95-103

For copper chemical mechanical planarization, a novel polishing endpoint detection was developed by combining light reflectance and eddy current with the skin effect. The two endpoint detection techniques are similar in principle, as both involve the penetration of electromagnetic waves into the copper film. In the former method, RSA (Ratio of Spectral Area) using white light is used to determine differences in reflectance by the range of wavelength. The endpoint

detection by the RSA is robust and stable during polishing. The latter employs the original mechanism of eddy current utilizing skin effect. The eddy current system can detect accurate film thickness corresponding to skin depth since a local maximum of eddy current appears just before polishing endpoint. The results revealed that the point at which the local maximum of eddy current emerged was the starting point of light transmission to the copper film. It was demonstrated that the two endpoint systems match well each other and it is possible to accurately detect the polishing endpoint based on the remaining film thickness through mutual confirmation of the two methods.



(a) Cross-sectional diagram of eddy current type end point system



(b) Cross sectional view of sensor part

(c) Top view of the plane inductor

Fig. 2. Configuration of the eddy current-type end point detection system.

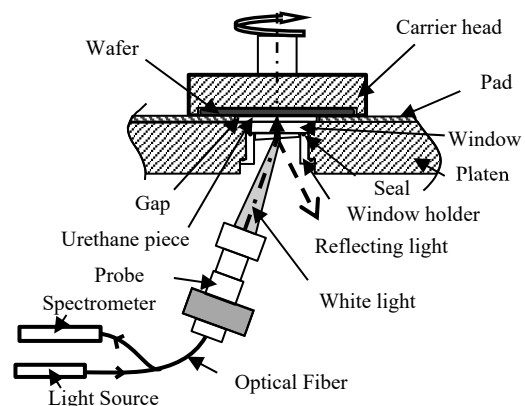


Fig. 3. Cross sectional view of the optical type.

Report of Young Researcher Night in ASPEN2019

In the 8th International Conference of Asian Society for Precision Engineering and Nanotechnology (ASPEN2019), Young Researcher Night (YRN) was held on November 13th, the first day of the conference. YRN was a banquet for all attendees of ASPEN2019 seeking the chance of international communication, networking and encouragement around young researchers. This event was organized by JSPE Affiliate, an organization of young leading researchers and engineers. 124 young researchers and engineers from various countries and regions, including France, Singapore, China, Korea, Taiwan, and Japan, attended YRN.

In order to facilitate the networking of attendees, several events took place in YRN.

3-minute shotgun presentation competition

10 selected speakers gave a 3-minute shotgun presentation on their research related to the contribution presented in ASPEN2019. All the attendees graded the presentation, and the following speakers were awarded:

Encouragement on Future Creation Technology

Mr. Liwei Ou, Dalian University of Technology, China

Encouragement on Leading Technology

Mr. Ching-Chih Wei, National Taiwan University of Science & Technology, Taiwan

Encouragement on Interdisciplinary Research

Mr. Krishan Chanaka Wickramasinghe, Tokyo University of Agriculture and Technology, Japan

Encouragement on Spectacularity

Ms. Xiaoyue Qiao, Shanghai Jiao Tong University, China

Short speech

Speakers who were randomly selected among all the participants gave a one-minute-long English speech on themselves and their own research. All speakers got lovely small gifts.

The many attendees, many interesting presentations and speeches, and many opportunities for meeting people made YRN very successful. We look forward to seeing you at ASPEN2021, which is scheduled to be held in Singapore, 2021.



Welcome address from Dr. Yohei Hashimoto, the chairman of JSPE affiliate (Kanazawa University, Japan)



All attendees enjoyed communicating and networking with each other



Speakers for the shotgun presentation competition and YRN committee members



Thank you very much for joining YRN!