



# The Japan Society for Precision Engineering

## Introduction of JSPE Young Engineer Awards 2014

### 1. Natsuko AOTA

(Namiki Precision Jewel Co. Ltd.)

#### Investigation on Pattern Shape Control Mechanism of Patterned Sapphire Substrates Fabricated by Wet Etching

The present achievement elucidates the control mechanism for pattern shapes using the wet etching method in surface processing of sapphire substrates for the purpose of creating high brightness, high efficiency GaN-based LEDs. It has demonstrated the ability for quantitative shape control through mixture ratio of acids in the etchant and different reaction mechanisms of sapphire with various acids. The promising outcome of this achievement is a new manufacturing process for high performance and low cost GaN-based LEDs. Therefore, the JSPE Young Engineer Award is presented for this achievement.

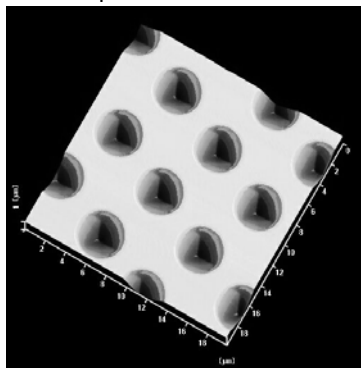


Fig.1 AFM images of patterned sapphire substrates fabricated by a mixture solution of  $H_2SO_4$  and  $H_3PO_4$  with the volume ratio of 1:1

### 2. Yuji KAWAHATA (Crystal Optics Incorporated) Development of Component Technologies and Etching Slicing Apparatus for Solar Cell Silicon

The present achievement relates to a newly devised cutting apparatus to reduce the cutting allowance to half or less than half of its current value, used in a newly proposed chemical cutting method for the silicon substrate manufacturing process. Because of the high speed reciprocal movement of the wire in the conventional wire-saw apparatus, there is substantial tension fluctuation; this leads to difficulty in the application of fine lines. Therefore, a new cutting apparatus with reciprocal movement of the wire-unit has been developed. It allows extremely precise cutting with a cutting allowance of 60  $\mu m$  or less.

Improvement of manufacturing technology for solar cell silicon will be brought by this achievement. Therefore, the JSPE Young Engineer Award is presented for this achievement.

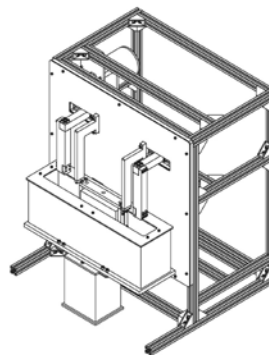


Fig.2 Developed cutting apparatus

### 3. Takuya HOSOBATA

(RIKEN Center for Advanced Photonics)

#### Development of Transparent 2-DOF Planar Electrostatic Actuator

The present study developed a transparent 2DOF electrostatic actuator that is driven by the electrostatic force generated by the application of AC voltage to two sheets of transparent plastic film. Thus, a method was established for the manufacture of electrostatic actuators using screen printing techniques. Furthermore, the arrangement of electrodes is optimized based on a geometrical analysis. The method is expected to derive from a variety of actuators in the future. Therefore, the JSPE Young Engineer Award is presented for this achievement.

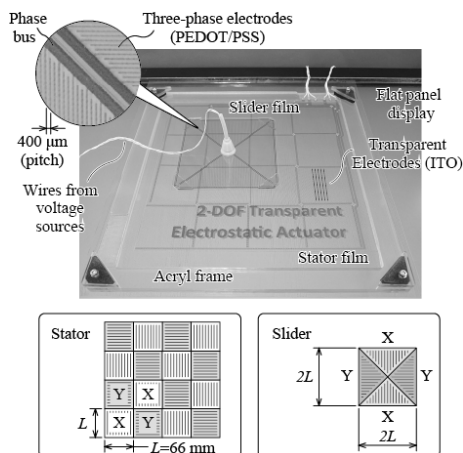
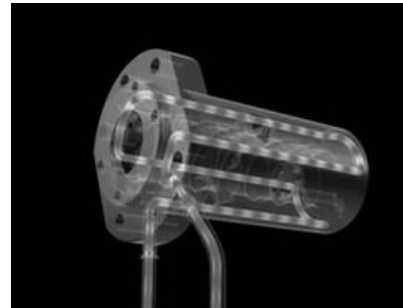


Fig.3 Transparent 2-DOF planar electrostatic actuator placed on top of a flat panel display

**4. Yutaka NAGAI and Masashi SHINDO (NSK Ltd.)  
Development of Nut Cooling Ball Screw for  
Machine tools**

The present achievement developed a nut cooling ball screw, which provides a cooling circuit for ball screw cooling—an essential machine element in machine tool feeds—on the nut side. A thermal analysis was performed for the heat transmitted from the shaft seal, the long hollow shaft, and the nut to the table, when the screw is hollow. The present technique allows for long ball screws of ca. 10 m, and has contributed to the improvement in precision of large machine tools. Therefore, the JSPE Young Engineer Award is presented for this achievement.



**Fig.4** Nut cooling ball screw

**Introduction of FA Foundation Award**

[Paper Awards 2014]

**1. Suppression of regenerative chatter vibration in multiple milling utilizing speed difference method - Analysis of double-sided milling and its generalization to multiple milling operations**  
*Eiji SHAMOTO, Tatsuya MORI, Burak SENCER,*

*Norikazu SUZUKI and Rei HINO*  
Precision Engineering, Vol.37 No.3 pp.580-589

**2. Development of an Outlier Reduction Method Intended for Confocal Profiling Sensor**  
*Hiroya FUKATSU and Kazuhisa YANAGI*  
J. JSPE, Vol.79 No.3 pp.248-252

**Report of The International Symposium on Ultraprecision Engineering and Nanotechnology (ISUPEN) 2015**

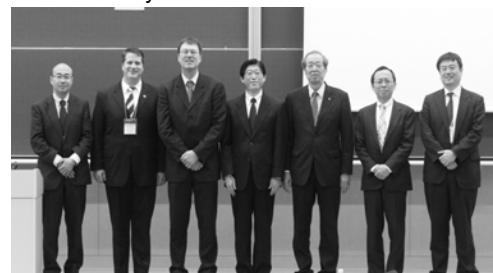
The International Symposium on Ultraprecision Engineering and Nanotechnology (ISUPEN2015) was held on March 17th, 2015 at the Hakusan Campus of Toyo University in Tokyo, Japan. Aiming to promote international relationships and enhance collaborations in the field of manufacturing among North America (ASPE), Europe (euspen), and Asia, the international symposium was held during the 2015 JSPE Spring meeting. The symposium is a biannual event that is organized by JSPE.

The symposium consisted of two parts. In the first, which was entitled “State-of-the-Art and Future Trends in Ultraprecision Engineering & Nanotechnology,” two delegates from ASPE and euspen and one from JSPE delivered plenary lectures. In the second part, young researchers who are expected to be next-generation leaders presented their latest results as cutting-edge technology.

Dr. Byron Knapp (Professional Instruments Company / President of ASPE) began the first part by discussing “Recent advances in precision choppers and goniometers for synchrotron applications.” Next, Dr. Oltmann Riemer (Universität Bremen / euspen Council) delivered a talk entitled “High Performance

Ultraprecision Machining.” Then, Prof. Hideki Aoyama (Keio University)-the delegate from JSPE-presented his research work entitled “State-of-the-Art and Future Trends on CAD/CAM Technology.” Fig.5 shows a photo that was taken at the end of the part. The second, third, and fourth individuals from the left are Dr. Byron Knapp, Dr. Oltmann Riemer, and Prof. Hideki Aoyama, respectively.

The second part comprised two sessions. The first session focused on “Design” and consisted of four presentations. The second pertained to “Machining” and included five presentations. The presenters in this part were young associate professors, assistant professors, and students, some of whom were recommended by the JSPE Affiliate Committee.



**Fig.5** Group photo: three plenary speakers and JSPE members