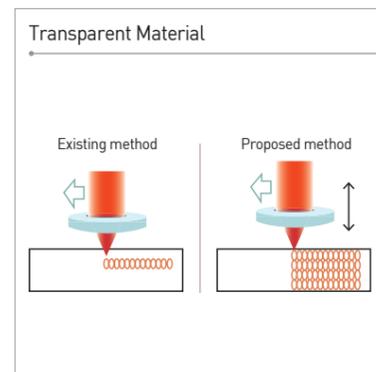


Transparent Material (Sapphire, Glass) Cutting Technology Using Hybrid Micropulse Laser System with Vibrator

Dr. Seonghak Cho
Department of Laser & Electron Beam
Application
T. +82 - 42 - 868 - 7077
E. shcho@kimm.re.kr



- ⇒ Femtosecond laser creates a micro-sized furrow or performs drilling on all materials.
- ⇒ With the focusing lens rapidly vibrating, the micro-sized furrow or drilling process efficiency increases.

Client / Market

- Companies interested in transparent material

Necessity of this Technology

- The goal is to simplification of the machining stages and improvement of machining quality.
- There are limitations with mechanical process and quality for machining of transparent materials such as glass and sapphire plates.
- When attempting to machine transparent substance using a general laser, machining does not work as the laser beam penetrates through the substance or creates an unnecessarily large crack.
- An alternative other than existing machining method for transparent material is needed to realize simplified machining stages and higher quality.

Technical Differentiation

- Laser machining is a method using non-contact machining method, and compared to mechanical machining, it can minimize unnecessary damage to the processed object.
- When machining a transparent object, due to the non-linear properties of femtosecond laser, it enables deeper machining on the same axis in the direction of clamping of focusing lens.
- One process achieves the effect of repeating several processes.
- When creating vertical vibration in the focusing lens of the femtosecond laser system using a vibrator, the focus position is adjusted vertically, and by machining vertically with this method, the part for machining on the object is intentionally extended in the longitudinal axis direction. Unlike general laser cutting machining where the machining restarts after focus adjustment, this process eliminates unnecessary steps.

Excellence of Technology

- The machining process realizes longer machining on the part of the transparent substance for machining in the longitudinal axis direction compared to the machining method with the general laser machining system as it uses the non-

DESIRED PARTNERSHIP

Technology Transfer

Licensing

Joint Research

Other



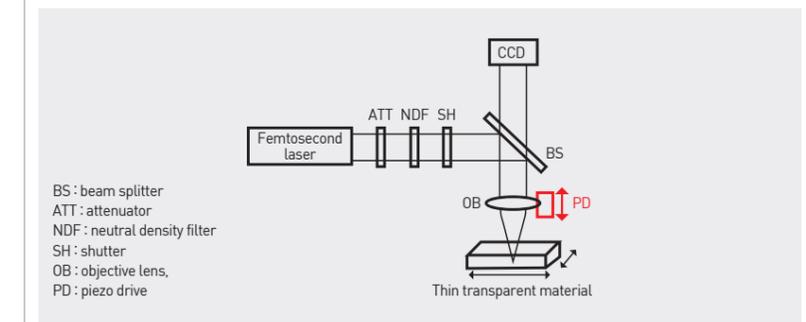
TECHNOLOGY READINESS LEVEL [TRL]



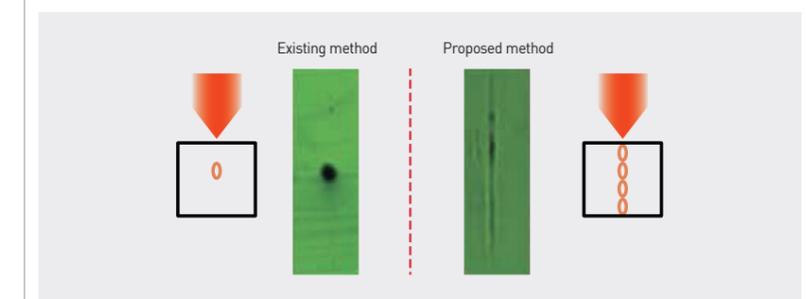
linear machining characteristic of femtosecond laser and the vibration system of focusing lens with the vibrator.

- The method ultimately cuts the object by maximizing machining in the direction of depth.
- The head researcher for this technology has over 10 years of research experience in ultrashort femtosecond laser-applied super-precision micro machining field.

Schematic Diagram of Laser Hybrid Device Structure



Example of General Machining and Machining Using Vibrator



Current Intellectual Property Right Status

PATENT

- Hybrid Laser Machining Device Using Vibrator (KR1273462)
- High Aspect Ratio Micro Shape Machining Device Utilizing Ultrashort Pulse Laser (KR1285717)
- Selective Plate Thin Film Remover Using Laser Machining Technology (KR1285876)
- Hybrid Laser Machining Device Using Ultrasonic Vibration (KR1049381)