

Ultra-precision Machining Technology for Micro/Nano Pattern Mold Core

Dr. Tae-Jin Je/Dr. Doo-Sun Choi
Department of Nano Manufacturing
Technology
T. +82 - 42 - 868 - 7142
E. jtj@kimm.re.kr/choids@kimm.re.kr

⇒ Technology to manufacture ultra-fine micro/nano pattern metal core required mandatorily to improve the special functions of high-performance advanced products based on ultra-precision machining technologies (turning, planing, end milling, indentation machining) with nano-level precision.

Client / Market

- Advanced core components market such as optical elements for advanced display (LCD/LED, OLED, AR/VR) and solar energy, meta structure, hologram, optical lens and optical communication, high-performance core element for medical/bio and mechanical component

Necessity of this Technology

- The demand from various advanced industries for high performance ultra-precision fine patterned components are rapidly increasing. However, the foundation technologies of ultra-precision machining technology for fine pattern are weak to effectively handle such demands.
- To achieve with performance advancement of high-quality products and the demands for high-performance products required for next-generation advanced industries, a high-efficiency micro-pattern mold core machining technologies based on ultra-precision machining technology of nano level is required.

Technical Differentiation

- Possible to manufacture various high-quality, high-profile micro-pattern from a few dozen nanometers to a few hundred micrometers required depending on properties and functions of core devices.
- Possible to manufacture an ultra-precision micro-pattern mold core to cope with roll-to-roll process, injection molding, and press forming required for mass production of high-performance advanced products
- Possible to apply integrated machining technology such as micro/nano complex shapes and high-dimensional shapes and fabrication of micro-pattern having irregular shapes and arrangement that can be utilized for next-generation advance industries

Excellence of Technology

- Ultra-precision machining technology on large area micro pattern roll mold for optical film manufacturing.



DESIRED PARTNERSHIP

Technology Transfer

Licensing

Joint Research

Other



TECHNOLOGY READINESS LEVEL [TRL]

Research, basic explanation | Project concept or idea development | Technology idea verification | Prototype development | Trial product production/evaluation in similar environment | Pilot field demonstration | Development and optimization of commercial model | Commercial product demonstration | Mass production and initial market launch



- The mold core for ultra-precision groove patterns, random stepped profile surface, lenticular patterns of several dozen nanometer to several dozen micrometer level for optical film manufacturing

- Ultra-precision indentation machining technology for irregular lens array patterned mold core to improve light diffusion property.

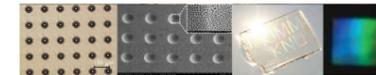
- Irregular lens array machining technology with minimum diameter of 15 μm and maximum fill-factor of 50%

- Light diffusion property improved up to 12 times



- Ultra-precision cutting technology with 3-directional crossing micro pattern large-area mold core for high-brightness retro-reflection property

- Intersecting point error within 1 μm, pattern shape error within 1 μm



- Mold core machining technology of micro pore lens array pattern for structural color revelation

- Micro/nano patterning technology for structural color revelation using mechanical/chemical integration machining



- Array pattern machining technology for aspheric, high aspect ratio paraboloid condensing lens mold

- Solar energy short-circuit current density enhanced by 10% with increased light-harvesting effect

- Ultra-precision machining technology of micro slit array for a meta-surface

- Ultra-precision micro slit array machining with shape error within 1 μm and position error within 1 μm

- Realizing a meta-surface to converts longitudinal wave into transverse wave

- Micro end milling technology of optical patterns for realizing 3D image

Current Intellectual Property Right Status

PATENT

- Processing Method for Aspheric Light Guide Plate Mold (KR1630021)
- Method for Manufacturing Working Tool of Mold for Manufacturing Optical Film (KR1767311)
- Method for Designing Random Dot Pattern and Method for Manufacturing Lens Array Member (KR2017-0142784)
- Micro Pattern Machining Method Using Tool Angle Control (KR1474974)

KNOW-HOW

- Pattern forming roll machining system and micro pattern formation method
- Discontinuous micro pattern formation device using indenter and the method
- Micro wave pattern machining system and method
- Stepped shape, right/left or top/bottom direction micro pattern design and machining technology
- Cutting tool design technology for micro pattern machining/measurement analysis and performance evaluation technology of micro pattern