Molding multi-layered precise structures widely and seamlessly

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**Outline of survey**

In order to manufacture an optical element for the display which functions to adjust brightness, polarization, color, view angle and so on, our project proposes to mold multi-layered precise structures widely and seamlessly. The structure, for examples, has a 10-layered, 100nm pitch, 3D-mosaic structure on a square sheet with a 2 meters side. The project will develop the following reproduction technology: (a) a roll or broach shaped mold that makes a linear, not facial, contact area between the mold and a reproduced raw sheet, and (b) a "repeated deposit-press mechanism" where the structure is repeatedly pressed with the precise mosaic mold after depositing a raw material thin-layer, or a "mosaic shearing mechanism" where the multi-layered reproduced sheet is sheared at a 1-layer step using the precise mosaic mold. MEMS (Micro Electro Mechanical Systems) or nano-imprinting technology, which had been researched since 1990 in the world, presented to make only the precise reproduced structure, not a multi-layered wide one yet.

**Expected results**

Through the execution of the project, the optical element with the multi-layered precise structures on the wide area will be realized using the developed molds. Moreover, the developed basic technologies will be applied into any reproduction processes; the process will be optimized using micro sensors or actuators that control the physical phenomena in the sub-micron sized space near reproduced structures; the elastic molds will be developed to reproduce the sub-micron sized structure even if the sub-micron thick gap between the mold and the sheet is locally generated; the optical performance will be simulated using the reproduced precise shape.

**References by the principal investigator**


**Term of project** FY2007—2011

**Budget allocation** 32,900,000 yen

(2007 direct cost)

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