

# Optimization of Tilt-Angle Dependence of Microneedle Tip-Size Fabricated by PCT Technique

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## Abstract

Deep X-ray lithography using synchrotron radiation exposure has been employed to fabricate the PMMA microneedle array with an additional process, so called Plain-pattern to Cross-section Transfer (PCT) technique. An appropriated X-ray mask pattern has been found by calculation of X-ray dosage. The optimized mask pattern shown in this paper consists of two isosceles triangles like a sandglass. Various dimensions of mask patterns have been investigated in order to obtain the tendency of tilt-angle dependence of the diameter of microneedle tip. The fabrication of microneedles with the tip-size of 200 nm was succeeded by using a mask pattern with the tip-size of 2  $\mu\text{m}$  and tilt-angle of 2.5-degree. 900 PMMA needles were consisted in a 1x1  $\text{cm}^2$  chip.

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