

Quadruplets-Microneedle Array for Bio-Medical Application

S. Khumpuang, G. Kawaguchi and S. Sugiyama

Abstract

Novel fabrication of a PMMA(Polymethylmethacrylate) microneedle array using synchrotron radiation deep X-ray lithography is presented in this work. Microneedles with holes are required for biomedical application. The crown-shaped structure with quadruplets-microneedle is an alternative design for handling blood without the fabrication of holes. The previous work reported a fabrication method of single-tip microneedle with nano-scaled tip-size. Currently, we applied the similar method to approach sharp tips with the new design for blood extraction purpose. The microneedles were fabricated by exposing X-ray to a PMMA sheet with a novel technique so called PCT (Plain-pattern to Cross-section Technique). The density is 1024 needles/cm² and the dimension of X-ray mask pattern has been optimized from four designs. A microneedle test on a chicken skin shows a tiny size of skin flaring after the penetration. By the capillary force, blood can be extracted and kept after flowing into the grooves. The grooves enhance the area of storing blood after the insertion of the microneedle to the skin.

Department of Robotics, Graduate School of Science and Engineering, Ritsumeikan University, 1-1-1 Noji-Higashi, Kusatsu, Shiga 525-8577, Japan