

## 基于MEMS技术的异平面空心金属微针

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摘要:

MEMS微针的一个重要应用是透皮给药。本文提出了一种基于MEMS技术的异平面空心金属微针。该微针首先利用硅(100)面刻蚀技术在硅片上刻蚀出深度为 $\mu\text{m}$ 的倒四棱锥, 然后采用电镀技术电镀出壁厚为 $50\mu\text{m}$ 的空心金属倒四棱锥。从背面开出微流道并去除残余硅, 就得到了倾斜角度为 $70.6^\circ$ 的异平面金属空心微针。最后采用ANSYS有限元仿真软件建立微针模型, 验证了微针具有足够的强度。

关键词: MEMS, 微针, 电镀, 异平面, 药物投送

## Out-of-plane hollow metallic microneedle based on MEMS technology

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**Abstract:**

An important application of MEMS microneedle is transdermal delivery. In this paper, an out-of-plane metal microneedle is fabricated based on MEMS technology. An inverse pyramid with the depth of  $330\ \mu\text{m}$  was first etched on a silicon chip using (100) silicon surface etching technology. Then a hollow metal inverse pyramid with the thickness of  $50\ \mu\text{m}$  was fabricated using electroplating technology. From the back side, micro channel was fabricated and then the silicon left was removed. An out-of-plane metal hollow microneedle with an incline angle of  $70.6^\circ$  was obtained. Finally, the model of the microneedle is built by the FEM software ANSYS to validate that the microneedle have enough strength.

**Keywords:** MEMS, Microneedle, electroplate, out-of-plane, drug delivery

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