

## A Machining Method of Cross-Shape Nano Channel and Experiments for Silicon Substrate

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**Abstract :** The paper innovatively proposes using the concept of specific down force energy (SDFE) and AFM machine to establish a machining method of cross-shape nanochannel on single-crystal silicon substrate. As for machining a cross-shape nanochannel by AFM machine, the paper develop a method of machining cross-shape nanochannel groove at a fixed down force by using SDFE theory and combining the planned cutting path of cross-shape nanochannel up to 5th machining layer it finally achieves a cross-shape nanochannel at a cutting depth of around 20nm. Since there may be standing burr at the machined cross-shape nanochannel edge, the paper uses a smaller down force to cut the edge of the cross-shape nanochannel in order to lower the height of standing burr and converge the height of standing burr at the edge to below 0.54nm as set by the paper. Finally, the paper conducts experiments of machining cross-shape nanochannel groove on single-crystal silicon by AFM probe, and compares the simulation and experimental results. It is proved that this proposed machining method of cross-shape nanochannel is feasible.

**Keywords :** atomic force microscopy (AFM), cross-shape nanochannel, silicon substrate, specific down force energy (SDFE)

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