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Fabrication of Nanosize Silicon Oxide Pyramidal Tip using Wet Etching Procedures

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Fabrication of nanosize thick silicon oxide pyramid on the cantilever has been performed using various wet etching techniques for sub-wavelength size metal aperture[1],[2]. Silicon (100) 10 Ωcm resistivity wafer was initially thermally oxidized at 1000 ℃ and followed by 300 ㎚ thick silicon nitride deposition using low pressure chemical vapor deposition technique(LPCVD).

The dot of (3 x 3), (4x 4) ㎛2 were patterned in order to fabricate V- groove using TMAH alkali solutions on the front side of the Si (100). The thermally grown oxide layer and thin silicon nitride layer was etched using plasma dry etching to create a etch window. The TMAH etching of the silicon (100) plane created V-groove due to the anisotropic etching from the different atomic density in the crystal plane. After formation of V-groove in the silicon sample, thermal oxidation at 1000 ℃ was followed.

The backside etch window was fabricated and 500 ㎛ thick silicon was etched with TMAH solution. The silicon oxide pyramid was revealed and the oxide pyramidal tip was carefully etched with HF acid solutions. The sub-wavelength size oxide aperture on the oxide pyramid was finally fabricated and thin metallic layer would be deposited on the both side of the pyramidal structure.

[References]

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