Anisotropic Etching of <100> Silicon Using a Novel UV-HNA Technique

K. Zandi, S. Haji, S. Mohajerzadeh,* K. Naeili, M. Mozafari and E. Asl Soleiman

Thin Film Laboratory, Department of Electrical and Computer Engineering
University of Tehran, Tehran, Iran

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Anisotropic etching of <100> silicon is typically accomplished using an alkali-OH solution such as potassium hydroxide (KOH) where (100) faces are preferably etched relative to (111) faces, which are exposed. In the technique proposed in this paper, silicon is anisotropically etched under ultraviolet exposure in a solution containing hydrofluoric/ nitric/ acetic acids (HNA). This solution is typically used for polishing silicon as well as for etching polysilicon due to its isotropic etching property. In this technique, which we refer to as UV-HNA, the etching of silicon is enhanced in the direction determined by UV exposure. A mixture of HF/HNO₃/CH₃COOH with a relative composition of 1:15:5 seems suitable for revealing (111) planes with an etch rate of 10 µm/h at 35°C. Etch rates as high as 60 µm/h can be achieved using a higher concentration of HF acid in HNA solution. In the latter case the etching is less anisotropic and mask undercut is observed.