

## Perpendicular Walls Fabricated in $\langle 100 \rangle$ -Oriented Silicon by Anisotropic Wet Etching

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Effects of anisotropic wet etching of silicon, especially the influence of the etchant concentration are investigated. In this method, the test structures are etched in  $\langle 100 \rangle$ -oriented silicon wafers in different KOH concentrations, and the resulting patterns are studied. Special interest is focused on the  $\{100\}$  planes which are shown to have significantly slower etch rates than the surrounding planes for high-KOH concentrations. By choosing a KOH concentration greater than 7 M we have succeeded in fabricating thin vertical walls on  $\langle 100 \rangle$ -oriented wafers.

### 1. Introduction

The anisotropic etching of silicon in certain alkaline solutions, i.e., KOH, EDP, etc., is one of the most widely used methods in micromachining. The expanding technology of micromechanics is leading to the application of anisotropic etchants in numerous devices. In particular, in the fabrication of solid-state pressure sensors and accelerometers, the use of well-defined anisotropic etchants is important for batch-fabrication and reproducibility of the sensors. The anisotropic behaviour is also used for some electrical devices, e.g., VMOS.

In all the applications mentioned above, the slowest etching plane is utilized. Different authors have demonstrated an etch rate ratio between the  $\{111\}$  planes and the  $\{100\}$  planes of at least 400 times.<sup>(1-6)</sup> This means that the  $\{111\}$  planes will act as boundary planes with well-defined angles to the surface. This phenomenon is used for creating V grooves in  $\langle 100 \rangle$  wafers and vertical walls in  $\langle 110 \rangle$  wafers. The purpose of this study is to obtain information about the etch rates of crystal planes,