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Compensating Corner Undercutting of (100) Silicon in KOH

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This article presents various methods for compensating the undercutting of convex corners of (100) silicon in aqueous KOH solution. By means of an especially developed measurement arrangement, the fast-etching planes in (100) silicon in aqueous KOH solution were identified as {411} planes, and their etch rates were measured. Based on investigations on a wide range of different underetched geometries, various compensation structures were tested and new structures were developed. Based on these results, theories on the dimensioning of existing and novel corner compensation structures were set up. The spatial requirements for compensation structures were remarkably reduced by combining different compensation structures. Thus the etching of novel devices containing convex corners defined by {111} planes, e.g., orbiting V-grooves, or truncated pyramids with low cross sections, is feasible.

1. Introduction

Development in the fields of microsensorics, actuatorics, and microsystem technology is essentially determined by the progress made in micromechanics. Thus the miniaturization of a variety of elements was achieved by the introduction of the third dimension in the structuring of silicon by means of anisotropic or isotropic etching techniques. Sensors and actuators based on silicon with simple geometries,