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Passivation Layer for Anodic Bonding of Silicon to Glass

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In order to avoid bonding or sticking of flexible silicon elements during anodic bonding of silicon to glass, we propose to apply a passivation layer of aluminum oxide to the glass surface. The investigated passivation layer was deposited using reactive sputtering of aluminum. Its breakdown field strength was measured and its effectiveness was proved in anodic bonding experiments.

1. Introduction

The large electrostatic forces which occur during anodic bonding of silicon to glass, can deflect flexible micromachined elements on the silicon substrate. When touching the glass surface, the flexible elements may bond or adhere to the glass (Fig. 1). This usually results in the loss of functionality of the assembled device. Silicon, silicon dioxide, nitride layers and metals will permanently bond to the glass surface. No bonding will occur if the glass is covered with a metal layer, but the elements might adhere to this layer since they are attracted by strong forces (sticking effect). The bonding and sticking of flexible elements, for example paddles, is a serious problem in the assembly of micromechanical sensors. In this paper, we propose a solution to this problem.