

研究论文

含IPA的TMAH溶液对湿法腐蚀硅倒金字塔阵列微观形貌演化的研究

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摘要: 采用含异丙醇(IPA)的TMAH溶液腐蚀经Si₃N₄掩膜形成10 μm×10 μm窗口的单晶硅片。在硅片表面得到了内壁光滑的倒金字塔V型口阵列。研究发现: 与纯TMAH对硅的各向异性腐蚀特性相比, 添加IPA使TMAH溶液对硅各个晶面的腐蚀速率减小, 致使含IPA的TMAH溶液对硅的腐蚀速率和各向异性因子比在纯TMAH中要小。通常认为, 腐蚀形成的倒金字塔结构侧壁晶面为(111)面, 但本研究表明, 由各向异性腐蚀形成倒金字塔的侧壁晶面随腐蚀时间发生了一系列转化。在腐蚀开始时, 倒金字塔侧面由(567)面逐渐向(111)面转化; 继续腐蚀时, 腐蚀面偏离(111)面, 向(443)面转化。

关键词: 材料表面与界面 湿法腐蚀 TMAH溶液 倒金字塔结构 侧壁晶面夹角

Studies on Microstructure Evolution of Inverted Pyramid - shaped Arrays Prepared by Wet Etching in TMAH Solution Containing IPA

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Abstract: The inverted pyramid-shaped arrays with smooth surface are studied using anisotropic wet etching in TMAH solution containing IPA, which were prepared on (100) orientation silicon wafers with the arrays of 10 μm×10 μm windows. Etching rates and anisotropic factor of the monocrystalline silicon are reduced by adding IPA to TMAH solution in comparison with pure TMAH. It is generally thought that the side facets of inverted pyramid - shaped structures are bounded by (111) planes, but this research indicates that inverted pyramid-shaped structures undergo dramatic changes in shape. At the beginning of etching, the side facets of the inverted pyramid-shaped structures go through the transformation of the (567) facets into (111) planes, then the etching planes deviate from (111) planes, exposing (443) planes.

Keywords: surface and interface in the materials wet etching TMAH inverted pyramid-shape structures intersection angles between side planes and (100) plane

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