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Nota di contenuto

Etching in Microsystem Technology; Preface; Contents; Table of Contents; Symbols; Abbreviations; 1 Introduction; 2 Distinctive Features of Microtechnical Etching; 2.1 Etching as a Fashioning Method; 2.1.1 Limits of Additive Microtechnical Pattern Generation; 2.1.2 Subtractive Pattern Generation; 2.2 Etch Rate and Selectivity; 2.2.1 Etch Rate and Time Request; 2.2.2 The Etching Process; 2.2.3 Transport Processes; 2.2.4 Process Velocities; 2.3. Isotropic and Anisotropic Etching; 2.4 Edge Geometry and Roughness; 2.4.1 Deviations from Ideal Geometry; 2.4.2 Flank Geometry in Isotropic Etching; 2.4.3 Fabrication of Low Slope Angles by Isotropic Etching; 2.4.4 Flank Geometries in Anisotropic Etching; 2.4.5 Setting the Flank Geometry by Partial Anisotropic Etching; 2.5 Accuracy; 2.6 Monitoring of Etching Processes; 3 Wet-Chemical Etching Methods; 3.1 Etching at the Interface Solid-Liquid; 3.2 Preparation of the Surface; 3.2.1 Surface Condition; 3.2.2 Cleaning; 3.2.3 Digital Etching; 3.3 Etching of Dielectric Materials; 3.3.1 Wet Etching by Physical Dissolution; 3.3.2 Wet-Chemical Etching of Non-Metals; 3.4 Etching of Metals and Semiconductors; 3.4.1 Outer-Currentless Etching; 3.4.2 Selectivity in Outer-Currentless Etching; 3.4.3 Etching of Multilayer Systems Forming Local Elements; 3.4.4 Geometry-Dependent Etch Rates; 3.4.5 Geometry-Dependent Passivation; 3.4.6 Electrochemical Etching; 3.4.7 Photochemical Wet Etching; 3.4.8 Photoelectrochemical Etching (PEC); 3.5 Crystallographic Etching; 3.5.1 Chemical Wet-Etching of Monocrystalline Surfaces; 3.5.2 Anisotropic Etching of Monocrystalline Metals; 3.5.3 Anisotropic Etching of Silicon; 3.5.4 Anisotropic Electrochemical and Photoelectrochemical Etching; 3.5.5 Porous Silicon; 3.5.6 Anisotropic Etching of Compound Semiconductors; 3.6 Preparation of Free-Standing Micropatterns; 3.6.1 Surface Micromachining; 3.6.2 Bulk Micromachining; 3.6.3 Porous Silicon as Sacrificial Material; 4 Dry-Etching Methods; 4.1 Removal at the Interface Solid-Gas; 4.2 Plasma-Free Etching in the Gas Phase; 4.2.1 Plasma-Free Dry-Etching with Reactive Gases; 4.2.2 Photo-Assisted Dry Etching with Reactive Gases; 4.2.3 Directly Writing Micropatterning by Laser Scanning Etching; 4.2.4 Electron-Beam-Assisted Vapour Etching; 4.3 Plasma Etching Methods; 4.3.1 Material Removal by Reactions with Plasma Species; 4.3.2 Plasma Generation; 4.3.3 Plasma Etching in the Barrel Reactor; 4.3.4 Plasma Etching in the Down-Stream Reactor; 4.3.5 Plasma Etching in the Planar-Plate Reactor; 4.3.6 Magnetic-Field-Enhanced Plasma Etching; 4.3.7 Plasma Etching at Low Pressure and High Ion Density; 4.3.8 Forming of Etch Structures in Plasma Etching; 4.3.9 Geometry Influence on Plasma Etching; 4.3.10 Plasma Jet Etching (PJE); 4.3.11 Applications of Plasma Etching; 4.4 Etching Methods with Energized Particles; 4.4.1 Sputter-Etching; 4.4.2 Reactive Ion Etching (RIE); 4.4.3 Magnetic-Field-Enhanced Reactive Ion Etching (MERIE)

Sommario/riassunto

Microcomponents and microdevices are increasingly finding application in everyday life. The specific functions of all modern microdevices depend strongly on the selection and combination of the materials used in their construction, i.e., the chemical and physical solid-state properties of these materials, and their treatment. The precise patterning of various materials, which is normally performed by lithographic etching processes, is a prerequisite for the fabrication of microdevices. The microtechnical etching of functional patterns is a multidisciplinary area, the basis for the etching p