

运用研磨和化学机械抛光技术制备高品质的石英薄膜

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摘要：

石英薄膜的质量是决定各种石英基底的微纳器件品质高低的关键所在。本文阐述如何运用研磨和化学机械抛光(chemical & mechanical polishing, 简称CMP)技术获得高品质石英薄膜的方法。由于石英属于高硬度材料, 选用金刚石研磨液和球墨铸铁研磨盘对石英衬底进行研磨, 以获得较高的研磨速率和较好的研磨后的表面粗糙度。在石英CMP中, 采用特殊的“两步抛”工艺, 对衬底进行抛光。第一步粗抛抛光液采用金刚石颗粒直径为0.3 μm 的研磨液与SiO₂颗粒直径为50nm的抛光液相混合, 第二步精抛只采用SiO₂的抛光液。实验结果表明, 采用上述技术, 可以获得高品质的石英薄膜, 厚度为25.1 \pm 3.2 μm , 表面粗糙度约为0.89nm (RMS)。

关键词：石英薄膜 研磨 CMP 微机电系统

High-quality quartz thin film prepared by lapping and chemical & mechanical polishing technology

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Abstract:

The quality of quartz thin film is a key to various kinds of quartz-based micro and nano devices. This paper presents techniques to gain high quality quartz thin film with lapping and chemical & mechanical polishing (CMP). Due to high hardness of quartz, diamond slurry and ductile iron plate are used for lapping the quartz substrate to get higher grinding rate and better roughness of the grinded surface. For CMP, a special procedure of “2-step-polishing” is developed, for which the first step is to use diamond slurry containing 0.3 μm particles mixed with SiO₂ slurry containing 50nm particles, and the second step is to use only SiO₂ slurry. Tested results show that a high quality quartz film, with thickness of 25.1 \pm 3.2 μm and roughness of 0.89nm (RMS), is acquired by using the techniques presented in the paper.

Keywords: Quartz film, Lapping, CMP, MEMS(Micro-Electro-Mechanical Systems)

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