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材料物理和化学

大尺寸TFT-LCD ECCP刻蚀工艺低耗整合

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摘要： 为简化大尺寸液晶面板四次光刻法的刻蚀工艺、减少有毒气体使用、降低射频功率消耗，在2 200 mm×2 500 mm大尺寸玻璃上，采用正交实验设计，验证了功率、气压、反应气体和比例等参数对各刻蚀步骤刻蚀速率、均一性和选择比的影响关系，从而得到各膜层的最佳工艺条件。在Enhance Cathode Couple Plasma Mode（ECCP）刻蚀模式下，采用新刻蚀条件合并薄膜晶体管有源区非晶硅、光刻胶、湿刻后源极和漏极剩余金属钼以及沟道非晶硅层干法刻蚀。利用扫描电子显微镜（SEM）对薄膜电学特性进行测试，结果显示，金属钼的刻蚀可以采用一次两步干法刻蚀，“2干2湿”刻蚀可以整合为“1干1湿”。整合后总刻蚀工艺时间减少16 s，减少了氯气使用量和RF总功率。试验改进了均一性和刻蚀率，同时对于下底衬具有良好的选择比，保持了良好的形貌，为大批量“1干1湿”生产提供了依据。

关键词： 低耗 钼刻蚀 阴极耦合离子 试验设计

Low consumption combination of large-sized TFT-LCD ECCP etch process

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Abstract: In order to simplify the lithography 4 mask etch process flow,reduce power and toxic gas volume,an orthogonal experiment was designed based on 2 200 mm×2 500 mm glass substrate. Using scanning electron microscopy (SEM) and electrical properties testing, the interacting influences of power,pressure,gas and gas ratio on etching rate,uniformity and selectivity were analyzed. Meanwhile,the optimized single layer process conditions was verified.Through a novel Enhance Cathode Coupling Plasma Mode (ECCP) etch condition,we combined active,halftone,wet etch residual metal molybdenum and N-plus doped amorphous silicon layers into dry etch fully. The result shows that the metal molybdenum etch can be divided into one time two steps, consequently, "2 dry 2 wet" etching can be modified into "1 dry 1 wet".Total etch time can be reduced by 16 s;overall Cl_2 gas dosage and power were also decreased.Uniformity,etch rate and selectivity to bottom layer were also improved,and the profile was controlled.The study presented a critical basis of "1 dry 1 wet "future mass production.

Keywords: low-consumable molybdenum-etch enhance cathode couple plasma design experiment

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