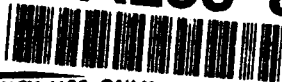


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ABSTRACT (Maximum 200 words)

Incorporating an aluminum layer to allow for contacting the arrays resulted in the generation of residual materials which compromised structures. Attempts to resolve the problem using alternate etch chemistries and protective layers were unsuccessful. A previously discarded wet etch approach was revisited and has produced structures. First attempts at driving the devices revealed shorts apparently due to sidewall deposition of Aluminum during the primary deposition. This can be overcome by optimizing position during the evaporation, and adding an oxygen plasma step to insulate any exposed Aluminum.

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Resonant Membrane Spatial Light Modulators

Final Report

Mark W. Miles

June 01, 1992

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After the first viable structures were fabricated, an aluminum layer was added to the primary deposition to allow for electrically contacting the secondary mirrors. Aluminum etching unfortunately produced etch products which not only attacked the photoresist, but were persistent themselves. Several approaches were tried to overcome this problem. The use of hydrogen plasmas to get rid of the photoresist, varied etch chemistries, and the use of a protective layer. All of these failed.

Since it was the use of a dry lift-off process which necessitated the addition of the Al layer during primary deposition, alternatives were considered. Before the use of SiCl_4 to achieve vertical sidewalls (discussed in report RMSLM05/06) a wet lift-off process was in use. This process step was effective but dropped because it seemed that complete underetching of the membranes did not occur in the final process step. It was then concluded that the spacer materials in use were not sufficiently soluble to allow for complete etch. Reconsideration suggests that the lack of vertical sidewalls, at that point in the research, may have been the actual cause. It became apparent that this approach might be worth revisiting.

Use of wet lift-off allows for the incorporation of an aluminum contacting layer which is not involved in the primary etch. Consequently, structure compromising residues should not be produced. This approach was attempted and viable arrays were fabricated.

The first attempts at driving the devices revealed the existence of electrical shorts between the primary and secondary layers. This resulted from sidewall deposition and shadowing during evaporative deposition of the primary mirror and spacer. Two solutions will be tried to eliminate this problem. First, an oxygen plasma step will be added after the liftoff to oxidize and therefore insulate any remaining exposed aluminum. Secondly, positioning within the evaporator will be optimized to reduce the amount of sidewall deposition which occurs.

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