FABRICATION OF MULTILAYERED WAVE INTEGRATED CIRCUITS IN A POLYMER MATERIAL SYSTEM

Jabberia R. Miller*, Harriss, J. E., Pearson, L. W.
Holcombe Department of Electrical and Computer Engineering, Clemson University, Clemson, SC 29634-0915

Abstract Submission Form

2004 National Radio Science Meeting

Abstract: miller17074

Date Received: October 1, 2004

1. (a) Jabberia Miller
328 Flour Daniel
Clemson University
Clemson, SC
29634 US
jabberm@clemson.edu
(b) 864-656-7213
(c) 864-656-7220

2. B - Fields and Waves

3. (a)

4. C - Contributed Paper

5. No special instructions

In recent years, workers at the University of Michigan have developed a multilayered technology for the fabrication of millimeter-wave integrated circuits (T. M. Weller, R. M. Henderson, K. J. Herrick, S. V. Robertson, R. T. Kihm, and L. P. B. Katechi, *IEEE Trans. Microwave Theory Tech.*, **48**(10), 1635-1642, 2001), (R. M. Henderson, K. J. Herrick, T. M. Weller, S. V. Robertson, R. T. Kihm, and L. P. B. Katechi, *loc. cit.*, pp. 1643-1651). This work employed extensive micromaching of silicon in the preparation of four-layered circuits.

A micromachining practice can be based on Epon® SU-8 photoresist manufactured by Shell Chemical. SU-8 supports micromachining of structures on substrates hundreds of microns thick. The material is a negative photoresist, polymerizing and becoming impervious to the original diluting solvent upon exposure to ultraviolet light. The exceptional optical clarity of SU-8 accommodates the formation of well defined walls in thick layers. All SU-8 patterning is conducted with UV and solvents, making it considerably easier and safer to process than micromachined silicon.

In this paper, we report progress in developing a practice for millimeter-wave circuit fabrication using SU-8 as the substrate material. Simply preparing "wafers" of precise thickness from SU-8 requires care. We have developed a molding process where the form comprises a silicon wafer and Teflon® sidewalls. Material near the mold edges is sacrificed, allowing consistent fabrication of 400 ± 15 micron rectangular wafers. We have developed circuits using coplanar transmission lines, thereby requiring a process for airbridge formation. Other components, including filters, electromagnetically coupled feedthroughs, and mounted semiconductor components. Available results for these will be presented.