Electrocomponent Science and Technology, 1984, Vol. 11, pp. 173–174
0305-3091/84/1102-0173 $18.50/0
© 1984 Gordon and Breach Science Publishers, Inc
Printed in Great Britain

SHORT COMMUNICATION

Fabrication of Schottky-Barrier Diodes using a Thick Film Technique

R. SARIN
Radar and Communication Centre, IIT, Kharagpur 721302, India

Y.R. PRADEEP
Electronics and Electrical Communication Engineering Dept. Indian Institute of Technology, Kharagpur 721302, India

(Received August 9, 1983; in final form August 9, 1983)

Schottky-barrier diodes have been fabricated using a thick-film technique. A change in V–I characteristic with firing temperature has been observed. This technique is compatible with hybrid circuit technology.

1. INTRODUCTION

Schottky barrier-diode fabrication has been reported by various authors using different technique, viz. point contact, vacuum evaporation, chemical deposition sputtering[1]. Another fabrication method has been successfully tried to achieve Schottky barrier V-I characteristics within reasonable limits. This method may be useful in the fabrication of Schottky barrier diodes in hybrid circuits, which are gaining importance because of their conspicuous advantage over thin-film hybrid circuits in certain applications.

2. FABRICATION

An n-type silicon wafer of 400 ± 25 microns thickness, with resistivity of 6 ohm – cm and a surface orientation ⟨111⟩ was used. The wafer was etched down by keeping it in fast silicon etchant (75 ml Conc. HNO_3 + 9 ml 48% HF + 17 ml CH_3COOH) for 80 minutes. The purpose was to reduce the bulk resistance. The etched wafer was cut into various pieces which were then placed on freshly silver-paste[2] printed Alumina substrate. The substrate was dried at 150°C for 15 minutes and fired at 900°C in a DEK840 furnace in nitrogen atmosphere (to avoid silicon surface oxidation) to achieve ohmic contact at the bottom of the wafer. Circles of diameter 0.45 mm in 3 × 12 array were screen printed on top using Poly390 screen, and fired at 500, 600, 750, 800, and 850° C. The firing time was ten minutes.

RESULTS AND CONCLUSIONS

The comparison of forward cut-in and reverse breakdown voltages for specimens fired at different temperatures is shown in Figure 1. The results suggest the presence of a thicker interfacial layer[1] between the fired silver and silicon for the samples fired at lower temperatures. The samples fired at and above 600°C showed very good adhesion to the surface. Ohmic contacts are formed above 840°C, the eutectic temperature of silver-silicon, as expected. This technique can be adopted using pastes of other metals available commercially

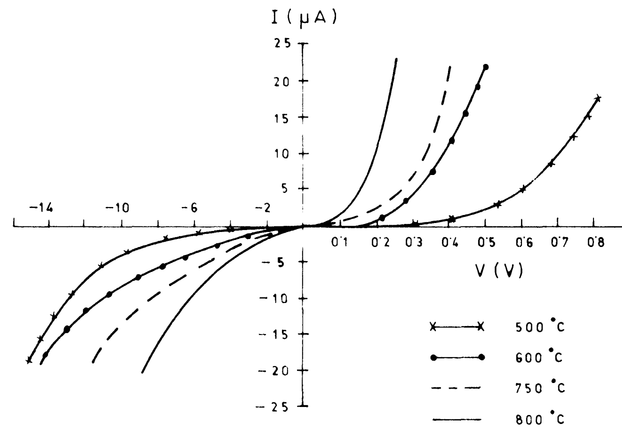

FIGURE 1 **V–I characteristic of the Schottky barrier diodes as a function of firing temperature.**

for thick film work. With the recent improvement in thick film technology the area of the diode can be reduced considerably.

ACKNOWLEDGEMENT

The authors would like to thank Prof. N.B. Chakraborti for providing the fabrication facilities.

REFERENCES

1. E.H. Rhoderick, *Metal-semiconductor contacts* (Clarendon Press, Oxford, 1978).
2. Silver Paste – type 200 TRANSENE COMPANY INC.