

At higher temperatures, the current-temperature variation rate drops significantly. The thermal stress cycles have small influence on the leakage current. For low voltage levels, the leakage current level is acceptable, even at high temperatures. It can be noticed that the SiC SBD sensor is biased at voltages below 5 V and at a current in the mA range. The thermal cycling does not produce strong mechanical stress. The SEM image of the thermally stressed capsules (Fig. 8b) does not show major glass modifications or degradations compared to the glass of the capsules processed (Fig. 8a).

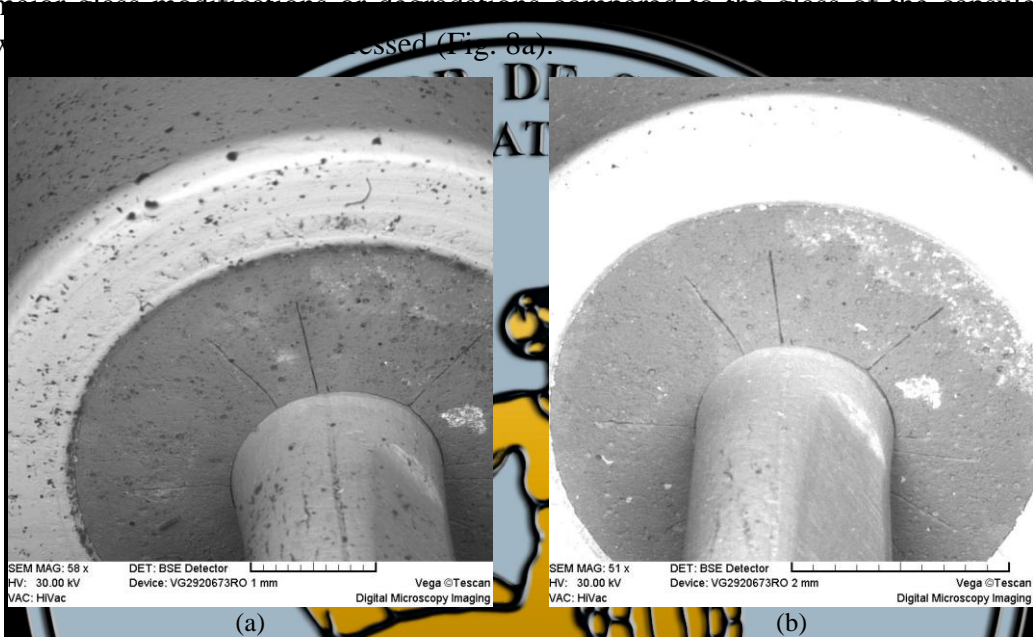


Fig. 8. SEM micrography of the case glass: (a) initially; (b) after 1000 cycles.

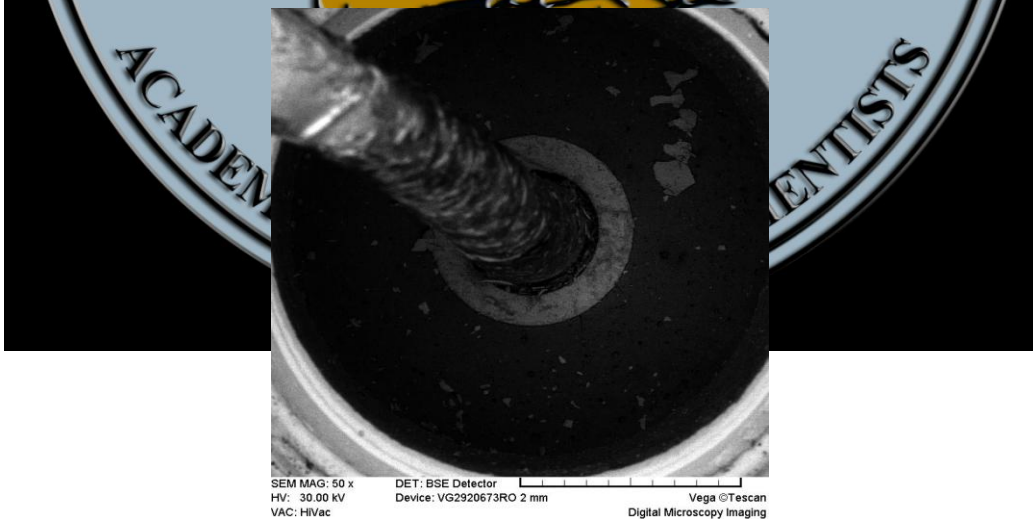


Fig. 9. SEM micrography of the case terminal at 1000 cycles.

Figure 9 illustrates the influence of the thermal cycling on the capsule's terminal. A pronounced corrosion of the copper terminal can be observed. This phenomenon recommends the use of a different metal or of an alloy which has a higher reliability with temperature.

5. Conclusions

A high temperature automating testing system for semiconductor devices was realized and tested. The electrical and temperature measurements demonstrated the system functionality. The system ability to create high temperature conditions (40-450 °C) allowed for testing devices on SiC, a semiconductor elevated temperatures. A custom software application was developed in TestPoint which executes the I-V characteristic of the DUTs.

The main advantage of this system is the high degree of automation and flexibility. These features make it suitable for thermal cycling tests, which need long time and large number of measurements for statistical data processing.

With this system we did preliminary thermal stress investigation on glass-metal packages that will be used for a temperature SiC sensor encapsulation. The thermal cycling performed in the these tests consisted of temperature variation from 50 °C to 400 °C and from 300 °C to 400 °C, respectively.

The presented experimental results demonstrate that the case is a good choice for the mentioned temperature range. The thermal cycling tests did not influence significantly the package leakage currents and did not degrade the package sealing glass. An evident corrosion of the copper terminal of the case has been revealed.

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