
Cement Mounting— Semiconductor Crystals

A number of methods for mounting semiconductor crystals in ways where they can be electrically heated and cooled are discussed throughout Section IV.A beginning on page 491. In the case of crystals which cannot be heated by electrical conduction, either because of unfavorable conductivity or because of unfavorable shape, it is possible to use a refractory cement that holds the crystal to a tungsten disk that is heated through welded contacts to refractory metal heating wires [1,2].

In Figure 152, an irregularly shaped SiC crystal has been cemented to a W disk using Aremco Ultratem 516 cement, which has a ZrO_2 base [3]. The W disk has previously been welded to a pair of Ta heating wires that pass current from the heavy W (1.5-mm-diameter) support leads. The cement is made electrically conductive by mixing with the appropriate amount of powdered graphite. This permits the electron spectroscopies to be used without sample charging.

A chromel-alumel thermocouple is connected to the back side of the SiC crystal by means of an alloy solder (90% Au/10% Ta) that anchors a tiny Ta tab to the crystal. The connection to the SiC crystal must be done in a preparative vacuum chamber to avoid gross oxidation of the crystal during induction heating.

Measurements with AES and XPS indicate that no migration of the ceramic cement occurs to the front of the SiC crystal up to 1400 K. The cement is adequate for mounting light crystals, but it is by no means robust.

At 1000 K, the temperature indicated by the thermocouple may be about 100 K too high compared to the true SiC temperature. The temperature range from 85 K to 1400 K was employed, and minimal outgassing occurs at 1400 K [1].

References

- [1] F. Bozso, L. Muehlhoff, M. Trenary, W.J. Choyke, and J.T. Yates, Jr. *J. Vac. Sci. Technol.* **A2**, 1271 (1984).
- [2] M.J. Bozack, L. Muehlhoff, J.N. Russell, Jr., W.J. Choyke, and J.T. Yates, Jr., *J. Vac. Sci. Technol.* **A5**, 1 (1987).
- [3] Obtain from Aremco Products, Inc., P.O. Box 429, 23 Snowden Avenue, Ossining, NY 10562-0429; the cement should be preserved in the refrigerator and has a limited shelf life.