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# UHV SYSTEM FOR THE ULTRAMICROGRAVIMETRIC STUDY OF SAMPLES LOADED IN A CONTROLLED ENVIRONMENT

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SUMMARY

The simultaneous measurement of mass change with a microbalance and residual gases with a mass spectrometer is widely used (ref. 1). To meet unique needs to measure the actual sources of water vapor from microelectronic packaging materials, a stainless-steel turbo-pumped UHV system with a bakeable automated vacuum ultramicrobalance and a quadrupole mass filter was designed to permit loading samples onto the balance from a controlled environment. The other major needs required measuring total mass changes of 1-2 $\mu$g to within $\pm$ 10% for 4-10 g loads and compatibility of the entire system for using pure water vapor.

A 20 g load capability of the ultramicrobalance permits using rugged hangdown suspensions. A line-of-sight positioning of a high sensitivity quadrupole allows direct analysis of the outgassing products and reduces the complications of significant secondary surface scrubbing reactions. For changing samples, an access port is opened into the controlled atmosphere of a dry box after backfilling the vacuum chamber with the same gas used in the dry box. A linear motion feedthrough with a bellows assembly is used to uncouple the sample hangdown suspension fiber and then raise the sample from the furnace region to the access port. Changing the sample and retaring of the balance is accomplished by operating a micromanipulator in the dry box using rubber gloves. A vacuum bakeout oven attached to the dry box is used for processing samples prior to storage in the dry box.

Representative results concerned with the water vapor adsorption and outgassing by a solder sealing glass illustrate attainment of the design specifications for the system. A detailed description of the apparatus and results obtained on the solder sealing glass using the balance and quadrupole are available (ref. 2).

REFERENCES

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