

APPARATUS FOR SIMULTANEOUS MEASUREMENT OF MASS CHANGE, OPTICAL TRANSMITTANCE AND REFLECTANCE OF THIN FILMS

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SUMMARY

The importance of the simultaneous measurement of mass change and at least one other parameter has been summarized recently (ref. 1). An apparatus has been developed that permits simultaneous measurement of mass change, optical transmittance (T) and front surface reflectance (R) of thin films. The T and R data permit study of the thickness dependence of the optical constants n and k , as a reaction product forms on a thin film.

The apparatus consists of an automated bakeable vacuum ultramicrobalance, a vacuum system with a thin film deposition assembly, a furnace, and computerized optical equipment for measuring T and R. The balance has a reproducibility of $\pm 0.1 \mu\text{g}$ and an operating sensibility of $\pm 0.2 \mu\text{g}$ in vacuum. The microbalance housing and sample hangdown tube contain quartz windows for carrying out optical measurements from 400 to 800 nm through a horizontally suspended substrate. Films are deposited onto the substrate to the desired thickness, as measured from the mass change during deposition. The films may be heated to 600°C in vacuum or in reactive gases obtained from an attached high vacuum station.

The apparatus has been described in detail (ref. 2). Representative results obtained during the preparation of a $\text{Cu}_{1.63}\text{S}$ film on a sapphire substrate and subsequent reaction in oxygen are also available (ref. 3). The latter report includes ISS, SEM and diffraction data taken after the film was removed from the balance.

REFERENCES

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