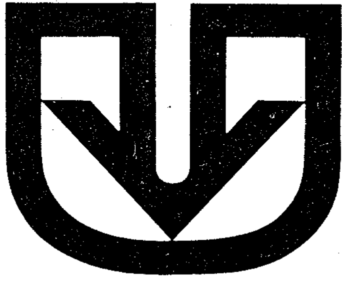

UVP APPLICATION BULLETIN

Bulletin A-113 The Source for Ultraviolet . . . ULTRA-VIOLET PRODUCTS, INC.

SEMICONDUCTOR WAFER INSPECTION

INTRODUCTION

A major cause of rejections in the semiconductor manufacturing process is wafer contamination. Due to the minute size of the circuitry, the presence of any particulate matter on the wafer surface will produce a failure. Because particles smaller than can be seen cause trouble, the inspector must assume smaller particles are present if larger ones are observed. This assumption has inherent shortcomings so that the better the inspection technique, the less this assumption needs to be relied upon.

The contamination can come from several sources. The most common are the air, wash solutions, process gases, photoresist and improper handling. Inspection, therefore, will occur at several stages during the development process.

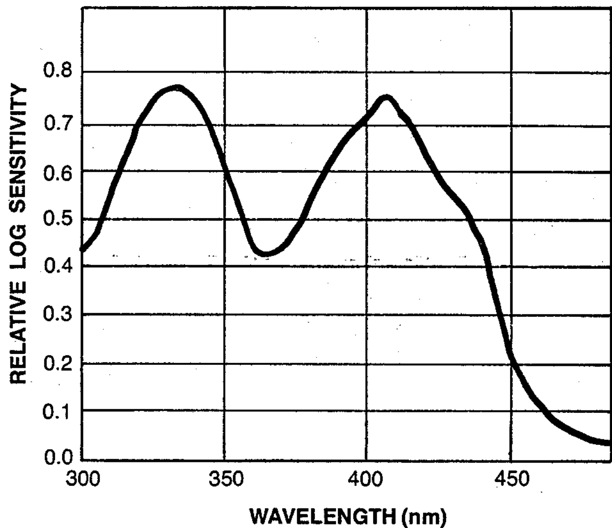

FIGURE 1: TYPICAL PHOTORESIST ABSORPTION SPECTRUM

INSPECTION AND LAMP REQUIREMENTS

The inspection lamp must have high intensity to maximize visibility. It must be portable and have a spot size large enough to cover the wafer which can be approximately five inches in diameter. An additional requirement is that the lamp not expose the photoresist during inspection. Once masked, the photoresist is exposed by a very high intensity lamp as part of the etching process. Prior to this operation, the resist is examined for uniformity and contamination, but the resist is photoactive and can be partially exposed by the inspection lamp if the lamp has emission in the wavelength region where the resist absorbs.

An absorption curve for a typical photoresist is shown in Figure 1. From this figure it is evident that the examination lamp should not have any significant intensity in the region below 450nm (4500A).

THE UVP INSPECTION LAMP

To meet these requirements, Ultra-Violet Products has manufactured the B-100Y BLAK-RAY®, Lamp a unique inspection tool designed for this specific application.

The B-100Y is a 100-watt spot lamp with two strong mercury lines at 546 and 579nm. This intensity permits the inspector to see particles less than 10 microns in size. At eighteen inches the spot size is approximately five inches which is ideal for optimizing intensity while maintaining a convenient work area. The lamp is fitted with a filter which blocks the emission for wavelengths shorter than 500nm which insures the protection of the photoresist. See Figure 2.

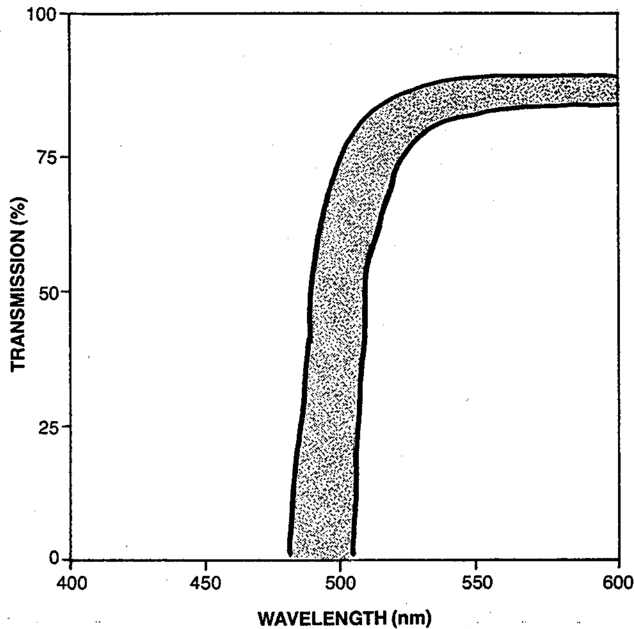

FIGURE 2: TRANSMISSION SPECTRUM FOR B-100Y FILTER

INSPECTION STAGES

To maintain a low rejection rate, inspection should occur several times during the development process, after the following operations:

1. Layer diffusion
2. Photoresist coat application
3. UV etching
4. Photoresist removal
5. During final Q.C. inspection

These inspection steps are used in conjunction with on-going quality control techniques and only slightly increase the overall production time.

CONCLUSION

The B-100Y is a high intensity, portable, spot lamp, designed to maximize particle detection and eliminate damage to photoresist. This lamp has many unique features which can generate tremendous savings in production costs for the semiconductor manufacturer.

For product information or additional technical information, contact UVP's offices below:

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