DDC NEWSLETTER

Volume 2, Number 3. April 27th , 2001

MAXIMIZING THE INTENSITY

This is usually accomplished by adjusting the mercury and rare gas fill ratio. This ratio of Hg to Xe is different for different lamp types such as the G-line, I-line and DUV types.

Source Size

Here we will only consider short arc lamps. For the short arc lamps, the arc size must be related to the optical components or, train of optical components through which the lamp radiation will be focused to make the exposure on the wafer. Power density is the critical factor for some optical systems. The closer the electrodes are spaced within the lamp envelope the higher the power density will be for a given input power to the lamp. This high power density produces a higher radiation intensity thus producing a higher e'tendue for the optical system. To this degree, it is vital that the lamp manufacturer and equipment designers work together from the very beginning of the system design.

LAMP SYSTEM STRUCTURES

We will now discuss the structure of the high power arc lamp. It consists of an envelope, electrodes, seals and fill. These items are treated in detail below.

ENVELOPE MATERIALS

Some of the characteristics of the envelope material is that it should be transparent to the required emitted radiation, impervious to air or fill gas and mechanically strong. Additionally sealing ability and cost are also issues. There are a number of different envelope materials and to understand their application, their cutoff wavelength (or short wavelength cutoff) is seen in the table 2 below and their use is described in this segment of the paper.

POSSIBLE ENVELOPE MATERIAL

Envelope Material	Short Cut off Wavelength (nm)
Sapphire	142
Suprasil Quartz	160
Clear Fused Quartz	220
Ti Doped Quartz	250
Ce Doped Quartz	380

Table 2. Envelope material and cut off wavelength

Three type of quartz envelope material are generally used in the fabrication of lamp envelopes;

Clear Fused Quartz (CFQ)- This is the most commonly used bulb material. It transmits almost all the discharge radiation except for the shortest wavelengths. CFQ is usually used for Hg Lamps and has an operational limit 600 deg C, a UV cut off about 220 nm and solarizes. Next is;

Ozone Free Quartz (OFQ). OFQ is made with an additive (typically titanium) which reduces the spectral output below 250 nm. The purpose of using OZF quartz is to eliminate the radiation below 250nm which produces ozone and is a health hazard in non vented areas. Cerium oxides can also be an additive in Ozone free quartz lamps. Cerium Doped Quartz (ref 7) has a UV cut off of 380 nm but the UV absorption gives rise to fluorescence in visible spectrum This material does not solarize and gives stable characteristics throughout lamp life. Titanium Doped Quartz (Hg OZF) is available in different grades with different cut off wavelengths for each grade as we have said, it prevents ozone formation and is less expensive than Cerium Doped Quartz but does solarize.

Lastly, we have Suprasil Quartz (or man made synthetic Quartz).

(TO BE CONTINUED)

NEWS

SID 2001 International Symposium is to be held in San Jose June 3rd-8th, 2001