DDC NEWSLETTER

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Comments: Please let us know your needs in Mercury, Xenon, Metal Halide lamps and also for UV curing lamps, UV Curing systems or lamp questions in general. We will try to be of help. Also, let us know how to improve the newsletter and include items that are of interest to you. Note, our new 2001 DDC folding Desk Calendar should be available for mailing in December. Please send in your request to receive it.

The article on Mercury Lamps from the last issue is continued below. (article by Bob Eckel & Bob Donofrio).

Lamp Operation
Lamps were first operated at a constant power level, but because of differences in output from lamp to lamp and aging effects, wafer exposure varied and yields were lower than they should be. In time a constant intensity exposure technique was developed where the lamps were operated at power levels below their rated wattage and then pulsed to some predetermined power level to provide a constant exposure intensity for each wafer. As the lamp aged the power level to which the lamp was pulsed is increased to maintain the constant exposure intensity. With intensity feedback to the power supply, each wafer receives the same joules/cm2.

Exposure Systems
The first exposure systems used a technique in which the mask pattern negative was in contact with the wafer, but this resulted in wear of the mask and required frequent mask replacement. Later proximity printing was developed where no contact was made to the wafer.

As optical techniques improved and wafer sizes increased from 2" to 3", 4" to 10" and now 12" in diameter. Additionally, using a single mask exposing the entire wafer, the number of layers and exposures being applied to each wafer caused wafer yields to decrease. To overcome this difficulty "step and repeat" printing was developed. In this system, a mask of only one or a few complete circuits is exposed on a portion of the wafer. After exposure, the wafer is moved so that a second and a third, etc. steps are used to expose small sections of the wafer until the entire wafer is exposed. "Step and repeat" gives closer registration of the pattern at each exposure thus significantly improving yields.

Mercury-Xenon Short Arc Lamps

a. Deep Ultraviolet (210nm - 250nm)
Working to print finer features optical photolithography proceeded to short wavelength exposures using new photoresist materials. One of these PRs is know at PMMA. The standard mercury short arc lamp has little or no emission for exposing the new DUV materials. The lamp industry developed a new Deep UV lamp for these PRs.by adding Xe to the Hg fill. A special partial pressure ratio produces an overlapping three band emission in the spectral region from 210-250 nm. Even with this output, the intensity is nowhere near that of the other Hg line emissions and thus longer exposure times were necessary to print PMMA resist materials.

b. I-Line Mercury-Xenon Short Arc Lamps (365nm)

The next innovations in lamp technology involved a much lower partial pressure ratio of mercury to xenon fill. The spectral distribution of this discharge which is known as the "I-Line lamp" shows a very intense but narrow 365 nm (I-line) mercury line. This lamp used in conjunction with a new technology known as "phase shifting" to print finer pattern geometries in the sub-micron range thus giving much higher component chip density.

Lamp Reflector News

Advantage Technologies of CA. is a new custom Electro-forming mfr. specializing in reflectors under nine inches. We will discuss this more in the next issue.