

Curing with UV LED's

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Abstract

UV LED Technology is arriving as the new approach for the curing of UV inks, coatings and adhesives. UV Process Supply has recently introduced the UV LED Cure-All. This lamp is powered by a UV LED array that is instant on/instant off, emits no heat and has a lamp life of over 50,000 hours.

1. The design and engineering of UV LED curing systems
 - a. The structural makeup of a UV LED
 - i. Makeup of UV LED's
 1. AlN (Aluminum Nitride)
 2. GaN (Gallium Nitride)
 3. InGaN
 4. AlGaIn
 5. AlInGaIn
 6. AlInGaIn/InGaIn
 7. Organic LED
 - ii. LED array options
 1. Wafer size
 - a. 50mm
 - b. 100mm
 2. Flip chip vs. Mounted chip
 3. Geometry
 - iii. Electrical specifications
 - iv. Light transmittance/ spectral output graphs
 1. Wavelength variance
 - a. Upper range: 415nm, 400nm, 390nm
 - b. Lower range: 385nm, 370nm, 365nm, 350nm
 2. Intensity variance
 - b. How to assemble arrays for large scale curing systems
 - i. Electrical requirements
 - ii. Back-end heat dissipation techniques
 - iii. Light uniformity management
 - c. Wavelength Optimization
 - i. Mixture of chip/spectral output architecture
 - ii. Curing responsiveness to mixed output
 - iii. Curing effectiveness of intensity vs. wavelength
2. UV LED technology vs. conventional UV curing

- a. UV LED benefits
 - i. Very low voltage requirements/electrical consumption
 - ii. 100% efficient in wavelength output
 - iii. No front-end heat generated, therefore no cooling required
 - iv. Instant on and off capability
- b. Applications that benefit
- c. Speed and effectiveness
3. Associated curing considerations
 - a. Improve cure rate/effectiveness via materials
 - i. Matching chemistry to lamp
 - ii. Designing lamp geometry for curing
 - iii. Secondary cure lamps
 - b. Improve cure rate/effectiveness via techniques
 - i. Inert gas inclusion
 - ii. Pulsed light
 - iii. Modified intensity
4. Industrial applications that this technology has been (and can be) applied to
5. What the future holds for this technology

This technology, while in its infancy, shows great promise to revolutionize the methods and effectiveness of UV curing. The very nature and size of the UV LED allows for increased flexibility, scalability and market reach. The limits of current UV curing can and will be expanded by these and other innovations.

Biography

Stephen Siegel founded UV Process Supply since its inception in 1979. As a consultant, innovator and business leader, Mr. Siegel has devoted over 20 years to the advancement of UV curing technology and has delivered numerous papers on radiation curing and its applications. Mr. Siegel has earned peer recognition for his continuing efforts to further the use of radiation curing throughout the world. UV Process Supply serves the complete production needs of radiation curing professionals.