Cork Tech TalkNews

Manufacturers of Waterbase, UV+EB Curable Coatings, Varnishes and Adhesives

08/04

SOLID-STATE TECHNOLOGY POISED TO CHANGE UV CURING

I first saw an LED (light emitting diode) cure a UV material just prior to the 2002 Radtech technology conference. Since that time you have been able to purchase these LED's in single units or in multiple custom designed arrays.

Photo courtesy UVPS

Features can be stated to be:

- **390 nanometer (nm) output**
- **no heat emission**
- **over 50,000 hours lamp life**
- **instant on-off**
- **minimum power consumption**
- **100% efficient**
- **scalable 1 inch diameter unit**
- **available with collimating lens to make emitted UV light parallel**
- **excellent spectral uniformity**

Benefits are:

- **ability to cure heat sensitive substrates**
- **shutters not required**
- **radiometers not required to monitor long life constant LED UV output**
- **collimating lens yields 25% UV curing performance increase**

Beyond the current evolving LED technology, new development is being reported indicating that solid-state devices are capable of being effective UV light emitters.

If we examine the history of bulb and tube technology, we find that solid-state technology has effectively replaced much of the early-developed technology. Transistors have replaced vacuum tubes; LED's are replacing light bulbs in all sorts of indicator lighting, automotive lighting, traffic signal lighting and other electronic applications.

What exactly are solid-state lighting devices? Also known as (SSD's) solid-state light emitting devices consist of a positive-negative junction made up of two dissimilarly doped semiconductors.

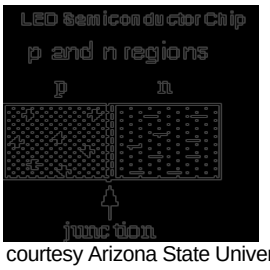


Diagram courtesy Arizona State University

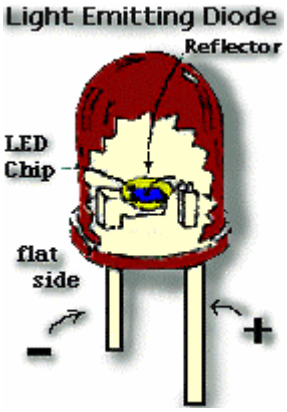
Positive electric charges populate the p region and negative charges dominate the n region. The junction provides a barrier to the flow of electrons between the p and n regions. When an external voltage is applied across the junction current is made to flow as electrons cross the junction into the p region. When the external electrical potential (voltage) is insufficient the junction acts as an effective barrier to the flow of electrons.

When the negative electrons move effectively close to the positive charges in the p region, the two charges combine and emit a photon of light. The wavelength of the light is dependent upon the characteristics of the

Cork Industries, Inc. 500 Kaiser Drive, Folcroft, PA 19032 610.522.9550 F 610.522.9659
Elmer W. Griese, Jr. 440.748.0980 ewgriesecork@oh.rr.com
Website http://www.corkindustries.com

semi-conductor material used and the doping (usually a combination of the chemical elements gallium, arsenic and phosphorus). Any material can emit photons only in a very narrow range of frequency. LED's can be made to emit different colors by the selection of different semi-conductor materials.

Solid-state UV light sources can be as simple as the LED array described initially or they may be designed to be as sophisticated as necessary.



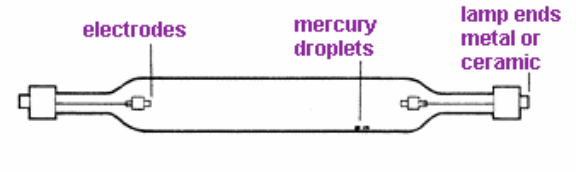
Varied industrial applications (small and large area) will no doubt demand these (specific to the job) sophisticated devices. SSD technology seems to offer the capability of being whatever you want it to be in terms of modular design.

Projected benefits of solid-state light sources:

1. **small size, thin flat panel**
2. **narrow band width (40nm typical)**
3. **10,000 hour life**
4. **>1 watt/cm2 irradiance**
5. **excellent consistency over time**
6. **excellent output uniformity**
7. **instant on-off**
8. **no shutter required**
9. **low consumables cost**
10. **reduced cooling requirements, air cooling adequate much of the time**
11. **low voltage, no ozone generation**
12. **low power requirements**
13. **PC controloutput intensity can be set between max and min by adjusting the current applied**
14. **efficient light production converting 15-30% of input electricals to UV light**
15. **pulse/intensity/duration formulations practical**

Judging by the attributed advantages listed above, SSD's seem to be on the cusp of providing an exciting new advance in UV curing equipment.

While traditional mercury arc UV lamps have been the mainstay of the UV curing industry for all of its existence, the technology is realistically old.



Not only that, but a constant move to new UV applications is placing new demands on curing equipment.

In summation, solid state UV light energy curing sources, tailored to the requirements of UV curing, promise to offer exciting new advantages. Among these will be modular adaptability, lower costs, higher speed, cool curing, output consistency, and new pulse/intensity/duration formulation curing. Further, the adoption of innovative technology always seems to have the capacity to foster new unique product applications.

Whenever you consider primers, top-coatings and varnishes, in the production & converting of graphic arts products, consider *CORK!*

LOOK TO CORK! **..... for all of your coating and varnish needs, for both aqueous & UV/EB coatings, vanishes and adhesives.**