White Paper: Moving to UV LED curing, the 365nm myth - a dance between physics and chemistry

Our latest **White Paper**, entitled ***Moving to UV LED Curing, the 365nm Myth – A Dance between Physics and Chemistry***, discussed the assumptions around using UV LEDs to cure adhesives, coatings, sealants, encapsulants and temporary masking materials. Despite some hints on product data sheets, 365nm may very well not be the best wavelength to pick if you are setting up or converting a curing process. Read more:

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Moving to UV LED Curing, the 365nm Myth

A Dance between Physics and Chemistry

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Many product data sheets for UV light curing adhesives and materials suggest that they need to be cured with 365nm UV light, or they show an example cure time with an intensity measured at 365nm. The implication is that these adhesives require a 365nm LED light to cure. This paper explains how a dance between physics and chemistry belies the myth that 365nm is always needed.

First, some chemistry

Ultraviolet-cured adhesives became available in the early 1960s but developed rapidly with advances in chemical and equipment technology during the 1980s. The large majority are cured by the free radical polymerisation of acrylate functional resins. Some chemistries (i.e. epoxy) are cured by a cationic reaction; this discussion still applies.

UV light curing adhesives are made up of monomers, oligomers, thickeners, adhesion promoters, and various other additives... and a relatively small proportion of photoinitiators (PIs). When the right light hits the PIs, they split and form highly excited free radicals, which initiate and accelerate the curing/crosslinking process. Supplying this appropriate light energy is key to a fast and complete curing reaction.

Long wave UV

For adhesives and most thick layer (> 50 microns) materials, long wave UV-A (315-400nm[1]) is required, because it has the ability to penetrate and give depth of cure. Short wave UV-C (100-280nm[1]) is confined to curing thin films like inks because its ability to penetrate is very low - UV-C is almost never observed in nature because it is completely absorbed by the atmosphere.

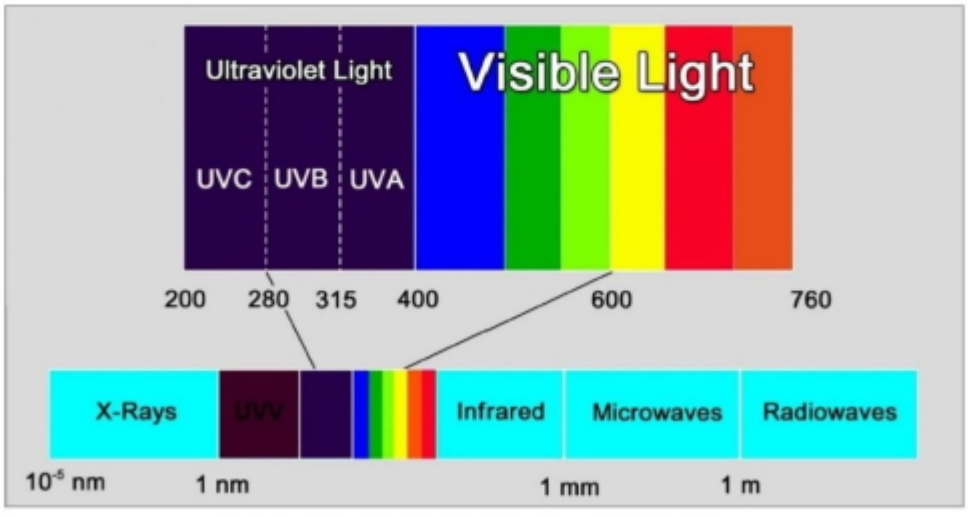

Figure 1 – The electromagnetic spectrum

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