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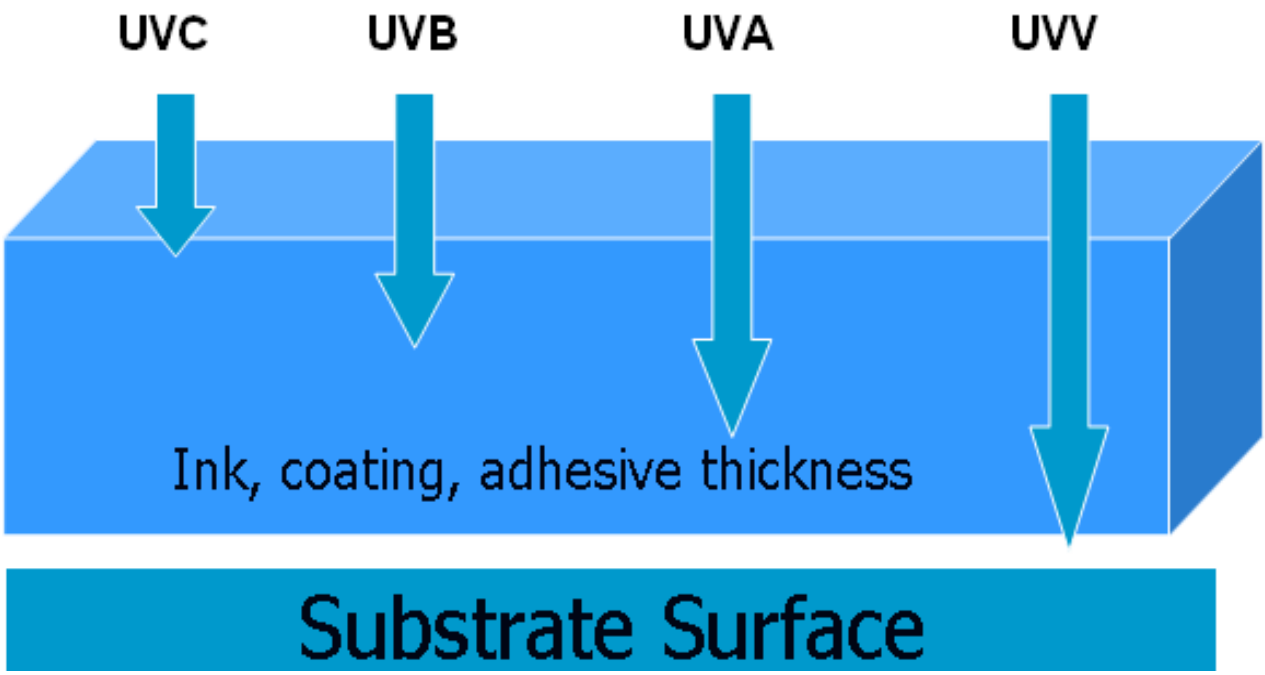
"The ABC's of UV"

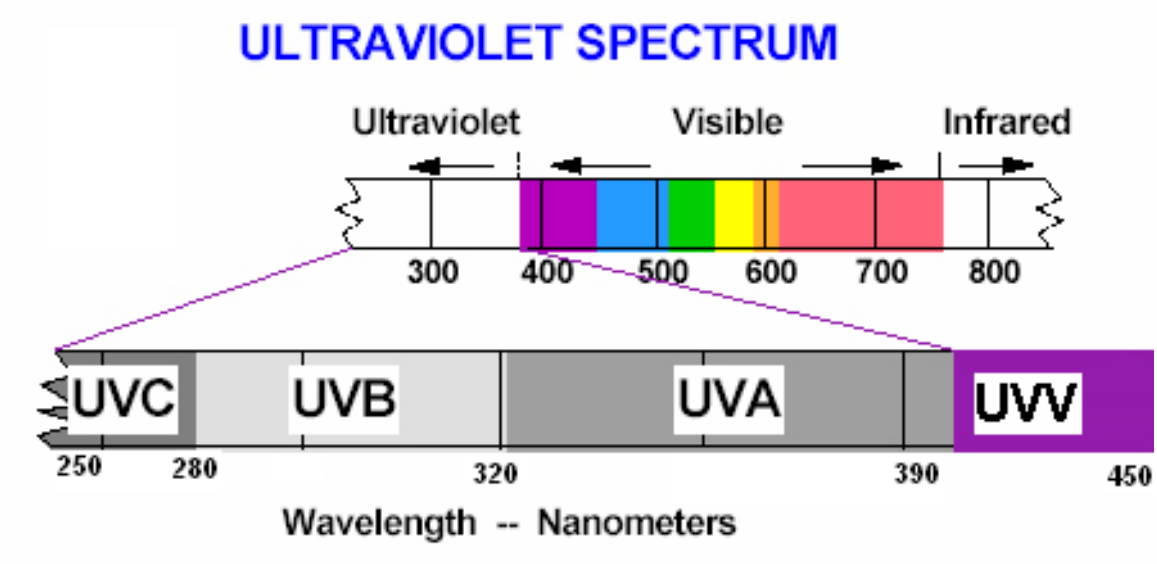
What is the difference between UVA, UVB, UVC, and UVV?

UV curing is a photochemical process that generally uses multiple UV wavelengths depending on the process requirements. These wavelengths each travel different distances through the substrate being cured. The UV ranges are named A, B, C, and V Here is some examples of their uses:



These wavelengths give different general cured material properties:

UVC= Abrasion resistance (surface hardness)
UVB= Coating / Adhesive Toughness and mid range cure
UVA= Adhesion and cross linking
UVV= Adhesion and Titanium Dioxide / Silver pigment curing



UVA

This is the long wave (strong UV) UV wavelength for use in general UV curing. UVA spans the 320 to 395 nm range. UVA is a long-range wavelength that works with many of the photo initiators in use today. UVA cures the “deeper area” on most UV formulations. UVA is responsible for most of the adhesion properties for the UV formulations. Because it right below visible light it travels the farthest of the only UV spectrum. Most UV bulbs for UV curing have their highest peak power in the UVA range. Most chemistries take advantage of this power for adhesion and maximum cross linking of the chemistry.

Some of the prime uses for the UVA range are:

UV cured inks
UV cured coatings
UV cured adhesives
UV inspection
UV fluorescing

UVB

This is the mid range (mid strength) UV wavelength for use in general UV curing. UVB is made right under the UVA and is has very similar uses like the UVA. UVB spans the 280 to 320 nm range. UVB is a mid-range wavelength that works with many of the photo initiators in use today. UVB cures the “middle area” on most UV formulations.

Some uses for UVB range are:

UV cured inks
UV cured coatings
UV cured adhesives
UV Disinfection and sterilization.

UVC

This is the shortest (weakest) UV wavelength for use in non-vacuum environments. UVC spans the 200 to 280 nm range but is generally measured in the 250 to 260 nm range because this is the most powerful output area of UVC. UVC does not travel well in air and is the first to drop off. Many UVC applications use a nitrogen purge environment because the oxygen actually blocks the UVC. UVC gives good “top cure” properties. UVC will give hard coatings their scratch resistant properties. A lack of UVC will cause a hard coating application to fail. UVC is the first to drop off when you have a bad reflector.

Some of the uses for UVC range are:

UV Hard coating of optical and automotive lenses
UV Clear top coating of paper and plastics
UV Germicidal / disinfection applications
Semiconductor manufacturing
DNA cross linking
UV Surface modification

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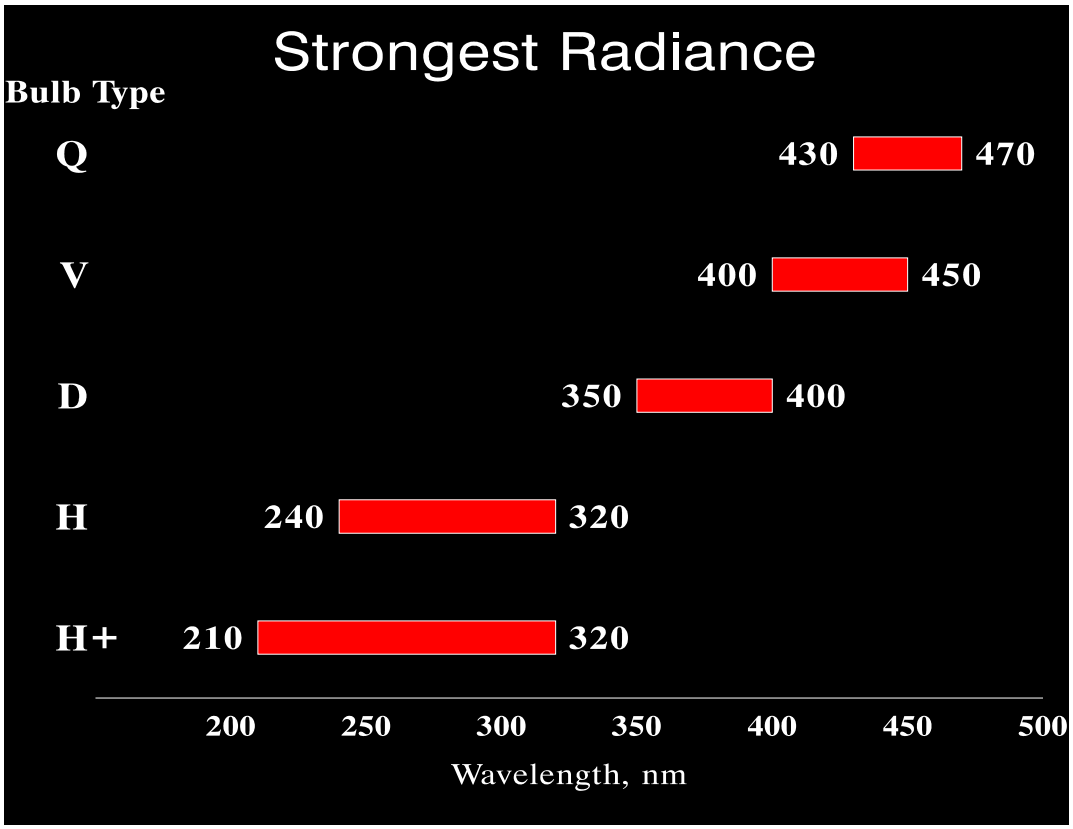
UVV

This is the longest wave (strong UV / Visible UV) UV /Visible wavelength for use in general UV curing. UVV spans the 395 nm to 455 nm range. UVV is a long-range wavelength that works with the newer “Visible” photo initiators in use today. UVV cures the “deepest area” on most UV/ Visible formulations. UVV is responsible for the adhesion properties for the UV / Visible formulations. Because it is the lower band of visible light it travels farther (deeper) than any UV only spectrum. Today’s newer chemistries take advantage of this deep cure visible light power for adhesion and cross linking of the chemistry. UVV works well with chemistries with white and silver conductive pigments

Some of the prime uses for the UVV range are:

UV / Visible cured silver conductive inks
UV / Visible cured coatings with TiO2 pigments
UV / Visible cured adhesives and deep potting compounds

Different type bulbs emit different useable wavelengths:



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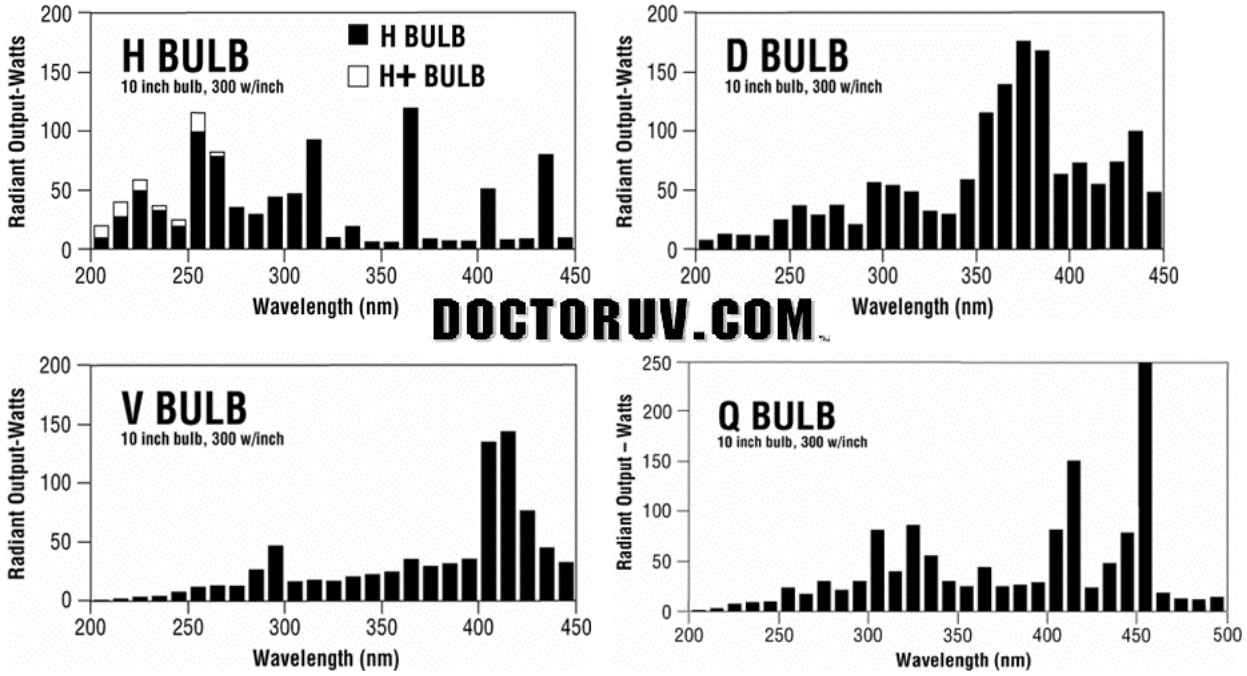
Below are the “spectral signatures” of the most popular Fusion microwave bulbs available today:



FYI- If you have an arc lamp system the **H** type bulb is generally called a “Mercury lamp”, **D** type bulb is called “Iron or Doped lamp”, and the **V** type is a “Gallium lamp”

I hope you find this quick explanation of the UV ABC’s helpful.

Douglas S. DeLong

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