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## UV CURING GLOSSARY TERMS UPDATE

**R**adTech International N. A. has updated its UV Glossary of Terms to provide common and technical meanings for use by the industry. Here is an abbreviated listing that should put everyone on a common footing.



**ABSORBANCE** - An index of light or UV absorbed by a medium compared to the light transmitted through it.

**ABSORPTIVITY (ABSORPTION COEFFICIENT)** - Defined as, the absorbance per unit thickness of a medium.

**ACTINOMETER** - A chemical system or physical device used to determine the number of photons in a beam integrally or per unit of time.

**ACTINOMETRY** - Determination of the number of photons in a beam per unit of time, or integrated over time.

**ADDITIVE LAMPS** - Medium pressure mercury vapor UV lamps to which metal halide(s) have been added to alter the output wavelength. Previously called doped lamps.

**BANDWIDTH** - The range of wavelengths between two identified limits, expressed in the same units as wavelength (nm).

**COLD MIRROR** - A dichroic reflector with low reflectance to IR compared to shorter wavelengths.

**COSINE RESPONSE** - Description of the spatial response to incident energy where response is proportional to the cosine of the incident angle.

**DICHROIC** - Showing significantly different reflection or transmission in two different wavelength ranges. Cold mirrors reduce reflectance of long wavelengths (IR) while hot mirrors enhance reflectance of long wavelengths.

**DIFFUSE** - A characteristic of a surface that reflects or scatters light or UV equally in all directions.

**DOPED LAMPS** - See & use additive lamps above.

**DOSE** - Energy absorbed per unit mass. Dose is a precisely defined term in EB curing and ionizing

radiation technologies. 1 gray (Gy) = 1J/Kg = 0.1 Mrad. Preferred UV terms are energy, effective energy density or exposure for energy delivered to a surface per unit area.

**DYNAMIC EXPOSURE** - Exposure to a varying irradiance as when a UV source (lamp) passes over a substrate or a substrate passes under a lamp.

**DYNAMIC RANGE** - The span between the minimum and maximum irradiance to which a radiometer will accurately respond. Commonly expressed as (watts) W/cm<sup>2</sup>

**EFFECTIVE ENERGY DENSITY** - Radiant energy, within a specified wavelength range, arriving at a surface per unit area usually expressed in joules per square centimeter, J/cm<sup>2</sup> or millijoules mJ/cm<sup>2</sup>.

**EFFECTIVE IRRADIANCE** - Radiant power, within a specified wavelength range, arriving at a surface per unit area.

**EINSTEIN** - Defined as one mole of photons.

**ELECTROMAGNETIC SPECTRUM** - A speed of light extremely wide range of radiation characterized by wavelength. Extends from radio waves, through visible and UV, to gamma rays.

**EMISSION SPECTRA** - Radiation from atom or atoms in an excited state, usually displayed as radiant power vs. wavelength; may be observed as narrow line or as quasi-continuous spectra emission and are unique to each atom or molecule.

**ENERGY DENSITY** - Radiant energy arriving at a surface per unit area, usually expressed in joules J/cm<sup>2</sup> or millijoules mJ/cm<sup>2</sup> per square centimeter. It is the time-integral of irradiance or the same as exposure.

**EXPOSURE** - Effective radiant energy density at a surface; the time-integral of irradiance within a specified bandwidth, expressed in J/cm<sup>2</sup> or mJ/cm<sup>2</sup>.

**FLUENCE** - The total radiant energy of all wavelengths passing from all directions through an infinitesimally small sphere of cross-sectional area dA divided by dA. Typically, J/cm<sup>2</sup> or mJ/cm<sup>2</sup>.

**FLUENCE RATE** - The radiant power of all wavelengths passing from all directions through an infinitesimally small sphere of cross-sectional area dA, divided by dA. Typically W/cm<sup>2</sup> or mW/cm<sup>2</sup>

**FLUX (RADIANT FLUX)** - The flow of photons, in einstein/second; one einstein=one mole of photons.

**HOT MIRROR** - A dichroic reflector having a higher reflectance of IR than to visible or UV.

**INTENSITY** - A generic term sometimes misused to mean irradiance and misapplied in UV curing.

**IRRADIANCE** - Radiant power arriving at a surface from all forward angles, per unit area, expressed in watts per square centimeter  $W/cm^2$  or milliwatts  $mW/cm^2$  per square centimeter.

**IRRADIANCE PROFILE** - The irradiance pattern a lamp; or, in the case of dynamic exposure, the varying irradiance at a point on a surface that passes through the field of illumination of lamp(s); irradiance vs. time.

**JOULE (MILLIJOULE)** - A unit of work or energy (a newton-meter). The time integral of power J or mJ.

**LIGHT** - Radiant energy in the visible range of the electromagnetic spectrum.

**LINE EMISSION** - Narrow lines of emission from an atom in an excited state.

**MONOCHROMATIC** - Light or UV radiated from a source that is concentrated in only a very narrow wavelength range (bandwidth) by filter or narrow-band emission.

**MONOCHROMETER** - An instrument that separates incoming radiant energy into its component wavelengths for measurement.

**NANOMETER** - Unit of length (nm) used to define wavelength of light, particularly in the UV and visible ranges of the electromagnetic spectrum.

**OPTICAL DENSITY** - It is the log of the ratio of visible light absorbed by an "absolute white" to the light absorbed by a measured ink ref. color printing.

**PEAK IRRADIANCE** - The intense, peak of focused power, the maximum point of the irradiance profile, directly under a UV source measured in  $W/cm^2$ .

**PHOTOMETER** - An instrument for measuring visible light, usually filtered or corrected to match the human eye response.

**POWER (RADIANT)** - The rate of radiant energy or total radiant power (W) emitted in all directions by a source.

**POWER (UV LAMP)** - Tubular UV lamps are commonly described by their operating power in "watts per inch or centimeter"; derived from the electrical power input divided by the effective length of the lamp.

**POLYCHROMATIC OR POLYCHROMIC** - Consisting of many wavelengths.

**QUANTUM YIELD** - A measure of the photon efficiency of a photochemical reaction. Based on absorbed photon flow, it is the ratio of the number of chemical events per unit time to the number of photons absorbed per unit time.

**RADIACHROMIC** - Exhibiting a change of color or optical density with exposure to light or UV.

**RADIANCE** - Generally refers to the radiant output of a source. It is the radiant flux per unit area per steradian ( $W/cm^2/sr$ ).

**RADIANT POWER** - Rate of energy transfer, expressed in watts or joules/second ( $W=J/sec$ ).

**RADIANT INTENSITY** - Power per unit of solid angle from a source, expressed in watts/steradian ( $W/sr$ ).

**RADIANT ENERGY** - Energy transfer, expressed in joules or watt-seconds ( $J=W(sec)$ ).

**RADIANT EXPOSURE** - See exposure.

**RADIOCHROMIC** - Preferred term is radiachromic.

**RADIOMETER** - A device that senses irradiance incident on its sensor element; incorporating either a thermal detector or a photonic detector.

**RESPONSIVITY (SPECTRAL SENSITIVITY)** - The response or sensitivity of any system in terms of incident wavelength. Can be used to relate to the relative output of a device vs. wavelength or be applied to the spectral response of photoinitiators.

**SPECTRAL OUTPUT** - The radiant output of a lamp vs. wavelength. Commonly displayed as a graph of output watts plotted against wavelength.

**SPECTRAL ABSORBANCE (ABSORBANCE SPECTRUM)** - Absorbance, described as a function of wavelength.

**SPECTRAL IRRADIANCE** - Irradiance, measured using a spectroradiometer at a given wavelength per unit area per unit wavelength interval ( $W/cm^2nm$ ).

**SPECTRORADIOMETER** - An instrument that combines the functions of a radiometer and a monochromator to measure irradiance.

**STATIC EXPOSURE** - Exposure to a constant irradiance for a controlled period of time.

**UV** - Ultraviolet and defined as radiant energy in the 100nm to 450nm range.

**UVA, UVB, UVC, VUV, UVV** - Designations of UV wavelength ranges. Ranges are: VUV: 100-200nm, UVC: 200-300nm, UVB: 280-315 nm, UVA: 315-400nm, UVV: 400-450nm. UVA is referred to as long UV wavelengths and UVC short UV wavelengths.

**WATT (MILLIWATT)** - The absolute meter-kilogram-second unit of power equal to the work done at the rate of one joule per second or to the power produced by a current of one ampere across a potential difference of one volt: 1/746 horsepower. W or mW. In optics, a measure of radiant or irradiant power.

**WAVELENGTH** - A fundamental descriptor of electromagnetic energy, including light. It is the distance between corresponding points of a propagated wave. It is the velocity of light divided by equivalent frequency of oscillation associated with a photon. Wavelengths are currently measured in nanometers (10<sup>-9</sup> meter).

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