Endex International

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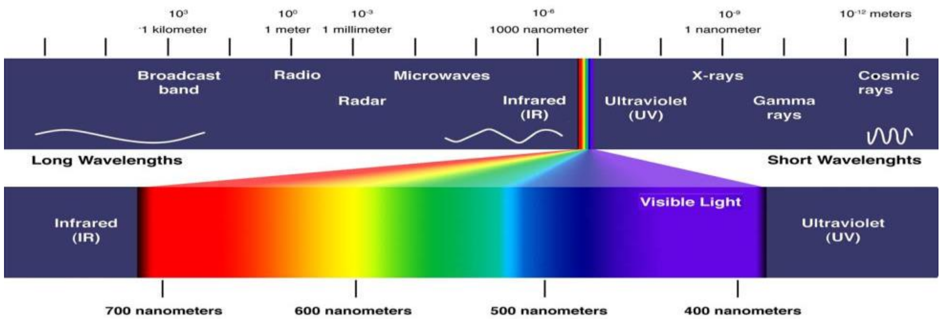
UVITA SME™ SPECTRAL MODIFIERS AND ENHANCERS

A New Approach to Ultraviolet Absorbers and Light Stabilization

Ultraviolet (UV) light is part of the electromagnetic spectrum between visible light and X-rays.



All current organic light stabilizers, from the class of ultraviolet Absorbers (UVA) to hindered amine light stabilizers (HALS), have known limitations. These include compatibility, volatility, migration, extraction, internal mobilization from layer to layer, chemical in-situ conversion over time, and blooming. These limitations also come with short term performance and high cost.

Conventional UVA differ from HALS in that they absorb energy in the 280 to 400 nanometer region of the electromagnetic spectrum. All known classes of these change in both plastics and coatings over time when exposed to light, and lose their absorbance properties. The trend in UV absorbers today is to use costlier triazine UVA, because of the limitation or elimination of hydroxy substituted benzotriazoles due to ECHA and REACH regulation on bioaccumulation and biotoxicity. This has become a product stewardship issue until they are mandated out of existence, which is only a matter of time.

Research and development in Plasmonics and Photonics have led to the development of a new class of Uvita™ Spectral Modifiers and Enhancers. These new Uvita SME™ work well alone, and especially well in combination with organic UVA and with their HALS counterparts, by slowing down in-situ consumption when exposed to UV radiation.

Uvita SME™ materials are inexpensive green chemistry derived from sustainable resources, and complement all organic UVA and HALS synergistically by increasing the absorbance of the UVA and HALS in the polymer system, while showing hyperchromicity and bathochromic shifts to higher wavelengths. They are very cost-effective and highly efficient in applications such as:

- INSECT VECTOR CONTROL DURING CROP PRODUCTION.
- CONTROL OF POST-HARVEST FOOD PACKAGED IN PLASTICS
- PROTECTION OF PACKAGING AND OILS BEYOND THE 400 NM RANGE.
- LAMINATED THERMOPLASTIC FILMS OVER PIGMENTED PLASTIC.
- DECKING AND ROOFING, AND SIMILAR OUTDOOR APPLICATIONS.

Very long term to permanent broad UV protection is the key to superior performance, and the Uvita™ SME technology to achieve this is available today. There are no known limitations for the use of this technology, which has been tested in condensation polymers, PET fibers and cast films and PETG, without any adverse effects. Polyolefin blown films and thick sections have been successfully tested in a variety of polymers. One denier PET fibers with 2400 ends were produced recently and found to have potential for military use in clothing and blankets for IR protection against night vision devices.

In summary, any polymer requiring long term broad UV protection will benefit from this disruptive innovation in Uvita™ Spectral Modifiers and Enhancers technology.

EXPLANATION OF TERMS

INFRARED: This is invisible radiant energy, electromagnetic radiation with longer wavelengths than those of visible light, extending from the nominal red edge of the visible spectrum at 700 nanometers (frequency 428.27 THz; 1.77 eV) to 1 mm (300 GHz; 1.24 meV), (although people can see infrared up to at least 1050 nm in experiments).

PLASMON: In physics, a plasmon is a quantum of plasma oscillation. As light consists of photons, the plasma oscillation consists of plasmons. The plasmon can be considered a quasiparticle since it arises from the quantization of plasma oscillations, just like phonons are quantizations of mechanical vibrations. Thus, plasmons are collective (a discrete number) oscillations of the free electron gas density, for example, at optical frequencies. Plasmons can couple with a photon to create another quasiparticle called a plasma polariton.

BATHOCHROMIC SHIFT: This is a change of spectral band position in the absorption, reflectance, transmittance, or emission spectrum of a molecule to a longer wavelength (lower frequency). Because the red color in the visible spectrum has a longer wavelength than most other colors, this effect is also commonly called a *red shift*.

HYPOCHROMICITY: This is the decreasing ability of a material to absorb light.

HYPERCHROMICITY: This is the increasing ability of a material to absorb light.

HYPSOCHROMIC SHIFT: This is a change of spectral band position in the absorption, reflectance, transmittance, or emission spectrum of a molecule to a shorter wavelength (higher frequency). Because the blue color in the visible spectrum has a shorter wavelength than most other colors, this effect is also commonly called a *blue shift*.