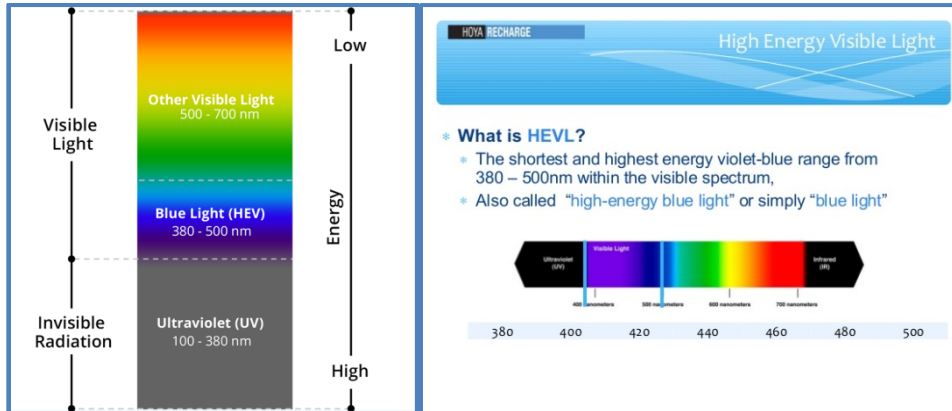
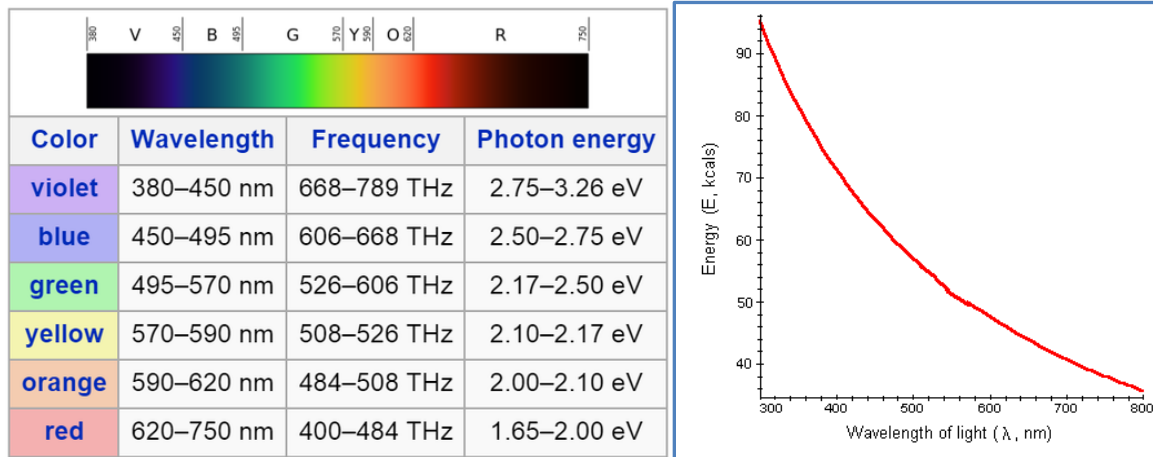


Blue Light Forgotten and Mostly Ignored Consequences

Historically the focus among the plastic and coating industry has been on wavelengths from 300 to 375 nm regions thought to be the dominant radiant energy that promotes degradation. However, little attention has focused on protection from the region of 380 to 500 nm. Blue light (HEV) is considered radiation in the 380 to 500 nm region.



This region is further broken down into blue (450 nm), indigo (460 nm), violet (440 nm), Deep Violet (422-400 nm) and Turquoise (501 nm). Corresponding photon energy given below.



The energy from this region of the electromagnetic spectra is sufficient to cause major issues in its transmission on rancidity of oils and foods containing oils. Studies show rancidity is rapid at 430 nm to 460 nm. In addition select fungi and molds respond positively to blue light wavelengths increasing growth and damage to vegetables, and flora. The greenhouse industry is especially prone to these type fungi that damage millions of dollars annually of both vegetables and flowers.

In packaging whether in bottle form or retort packaging the need to protect the contents from harmful radiation from interior fluorescent, sodium vapor lighting, LED and incandescent light sources has become a focus of attention globally. The standard requirement has continued to focus on the use of titanium dioxide and zinc oxide in packaging. Both have their limitations and known prodegradant effects on stability in many forms.

What is currently lacking are systems to extend the standard range of 300-375 nm into the 380-500 nm region while providing zero transmission in the UV region of 300-375 nm and equally limited transmission in the blue region.

New technologies based on Plasmonic mechanisms have led to Spectral Enhancers that compliment or work alone to protect the contents in plastic fabricated products and substrate protection for coatings in a broad but permanent fashion. Permanence with no migration and no blooming or extraction is the key.

UVITA SME products currently provide broad UV protection from 200-800 nm while protecting the mid infrared thermic region for film applications in greenhouse and military applications and far infrared absorbance for military and photonic applications.

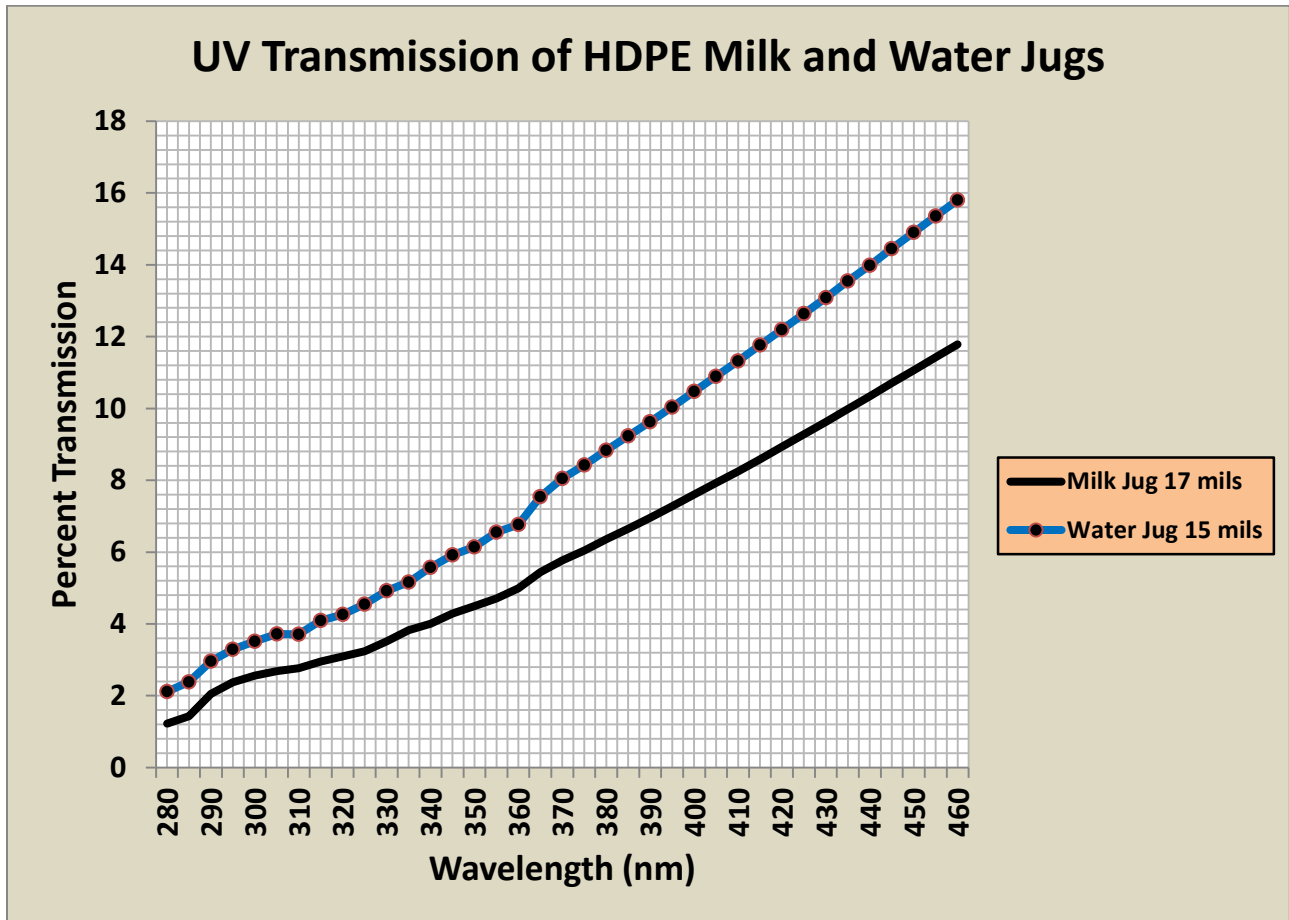
Permanence means no change in transmission over time. Unlike organic UVA that undergo in-situ conversion over time and dramatically differ in this conversion depending on polymer matrix and chemistry of the system UVITA SME has no such limitation. In addition UVITA SME in combination with hydroxy- substituted benzophenones, hydroxyl substituted benzotriazoles and other organic classes of UV absorbers will enhance performance through hyperchromicity and bathochromic red shifts.

Therefore, initial design of a polymer system having higher absorbance at lower cost with greater stability towards in-situ conversion over time at lower cost benefits everyone.

Currently UVITA SME 3811 Spectral Enhancer has found a home in those applications where environmental conditions of higher thermal gradients in the 40-45C range outdoors for roofing, greenhouse, and silage, and packaging where the need for no migration, no extraction and no change in absorbance or transmission over time is required. Broader wavelength absorbance and synergisms makes the product much more cost effective and flexible in any polymer end use application.

Figure 1

Commercial applications like HDPE gallon jugs show the level of transmission based on thickness:



Transmission at the higher wavelengths increases. It is not uncommon for 10% transmission at 430 nm for milk containers.

Figure 2

When look at very thin films (1-5 mils) containing UVITA SME we see the following trends:

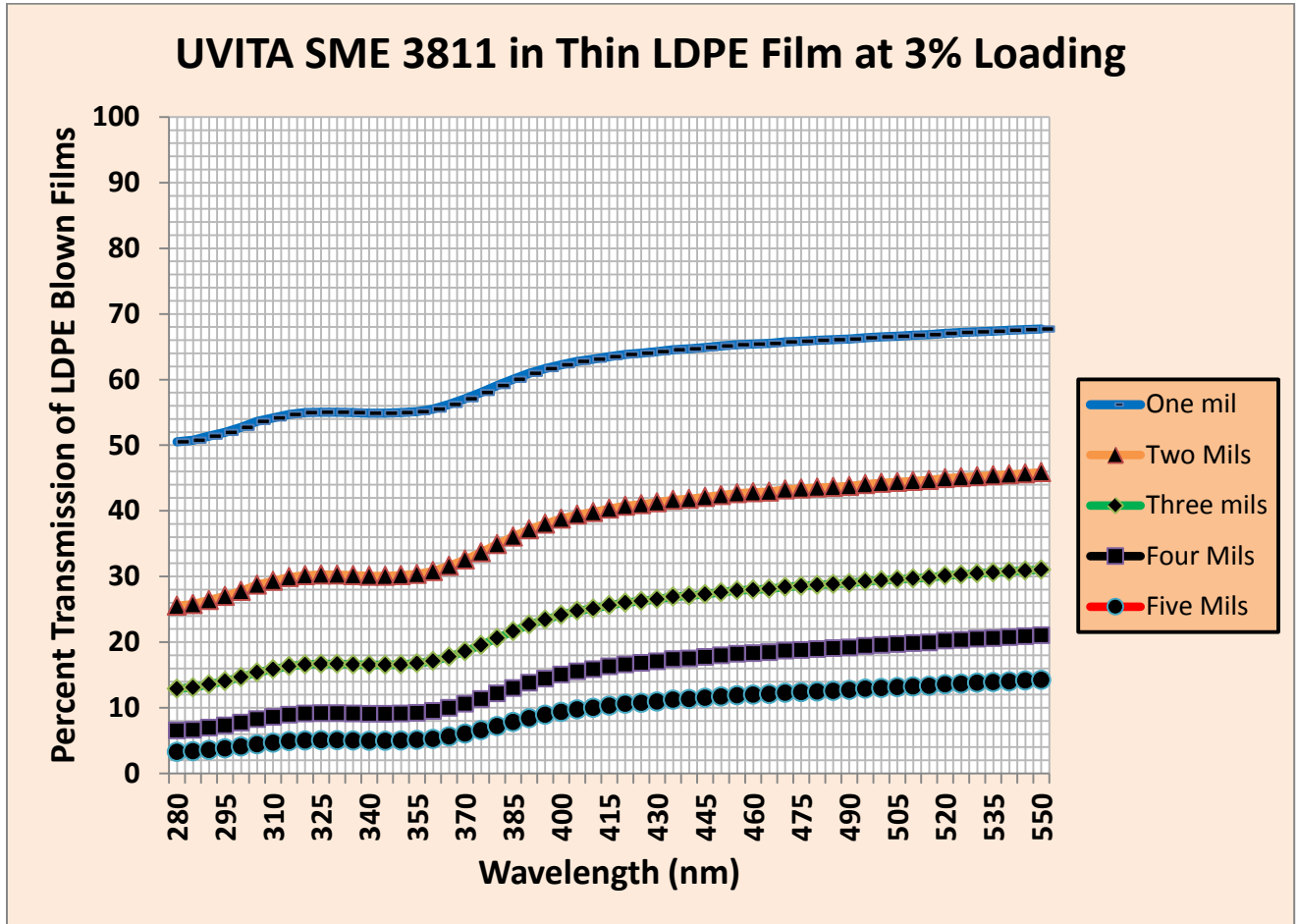
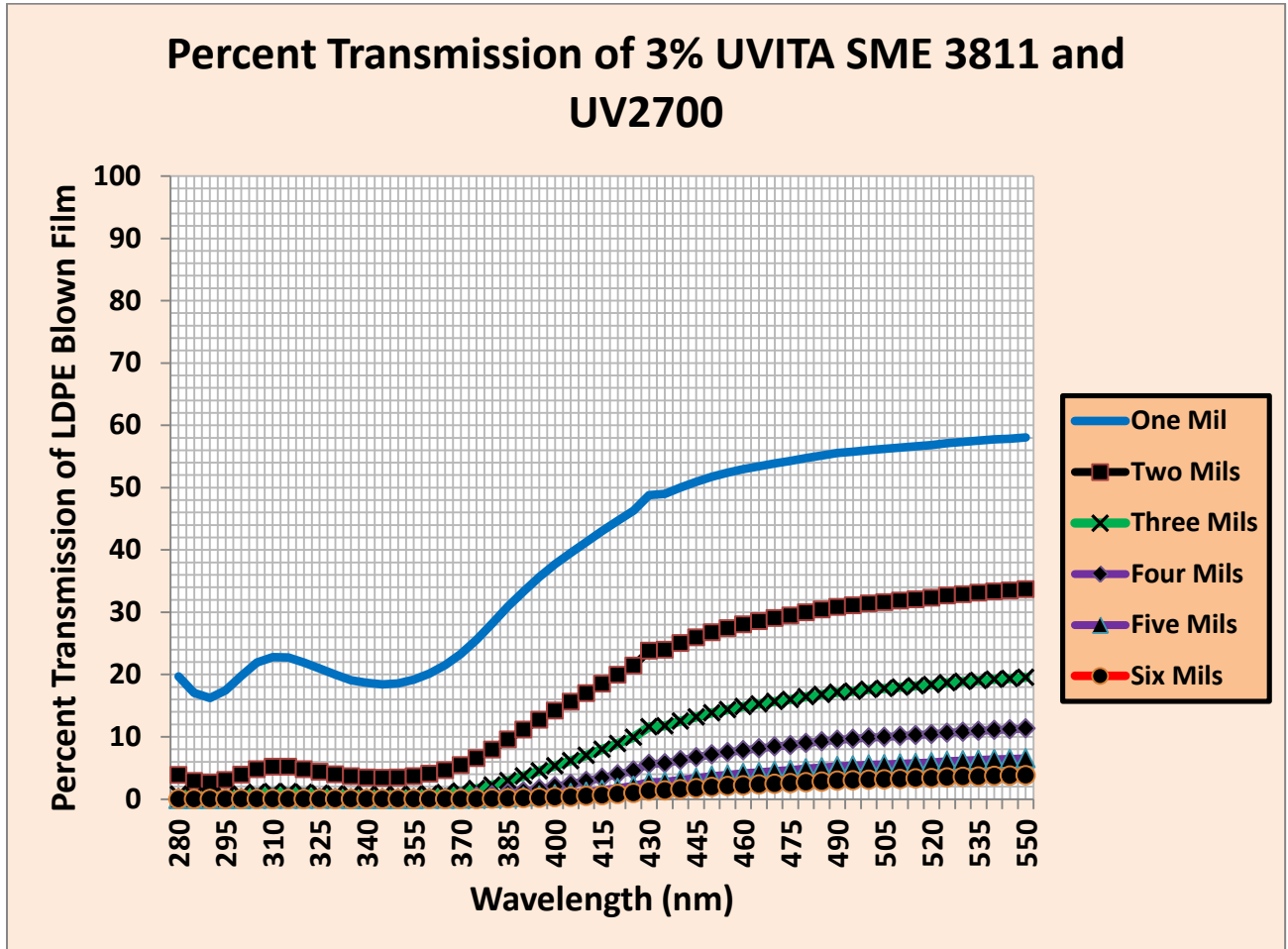


Figure 3

When we combine UVITA SME with an Organic UVA like Maxgard 2700 we achieve the following:



A significant reduction in transmission for each corresponding film thickness.

Figure 4

In injection molded 30 mil thick sections the concentration of UVITA SME is significantly reduced due to thicker sections as would be expected. The synergism is the same.

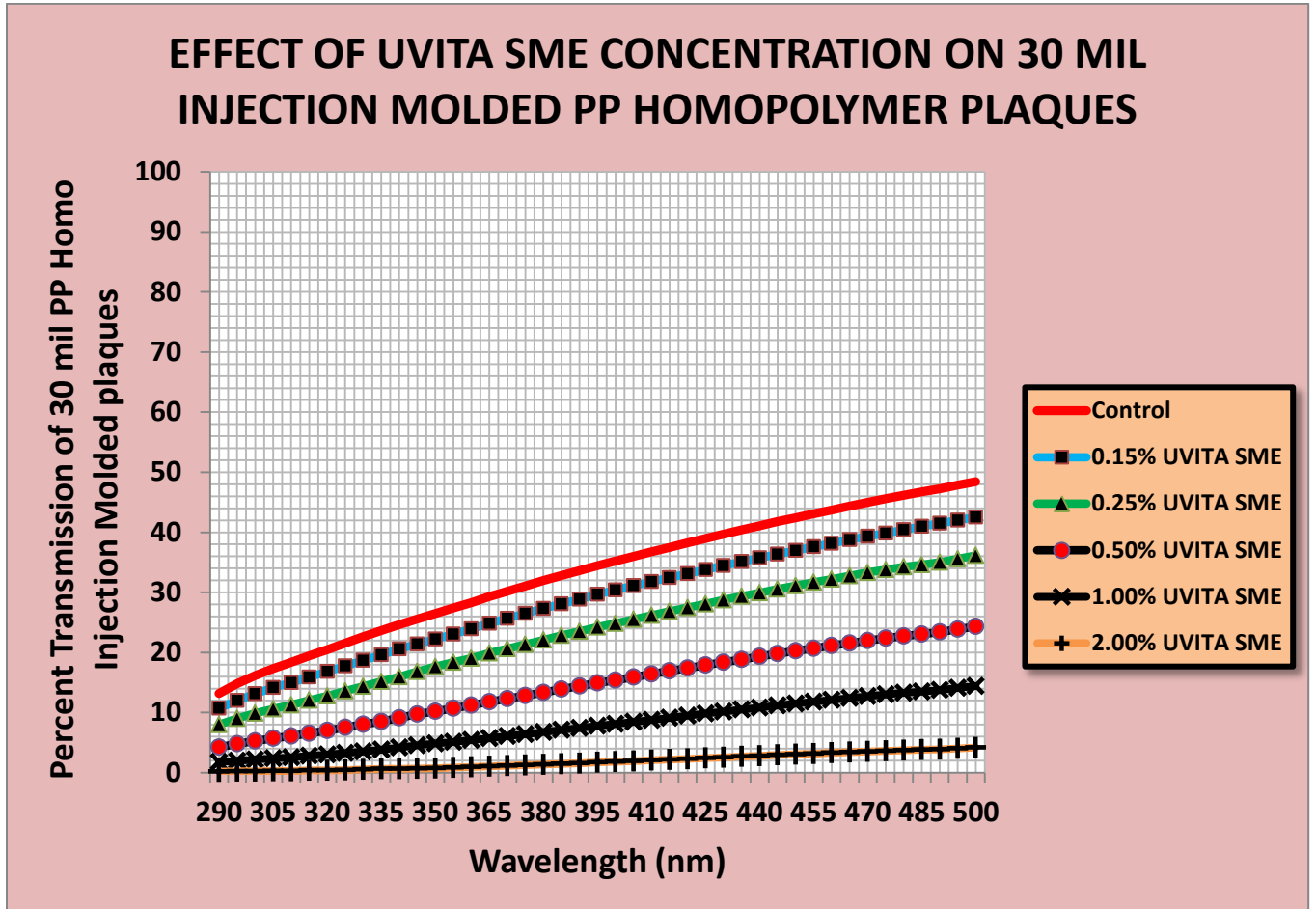


Figure 5

Synergisms:

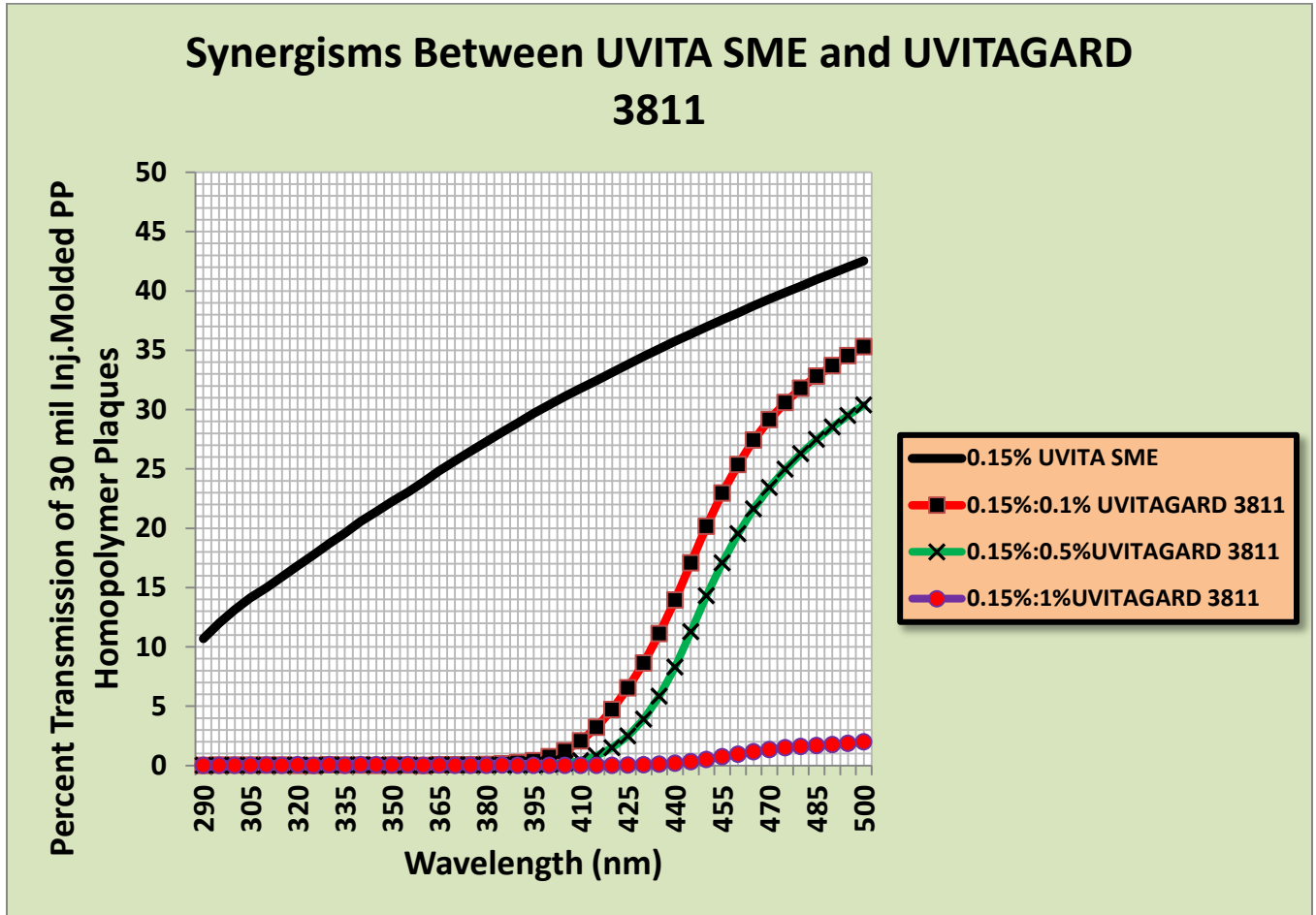


Figure 6

UVITA SME 3420 Synergism:

