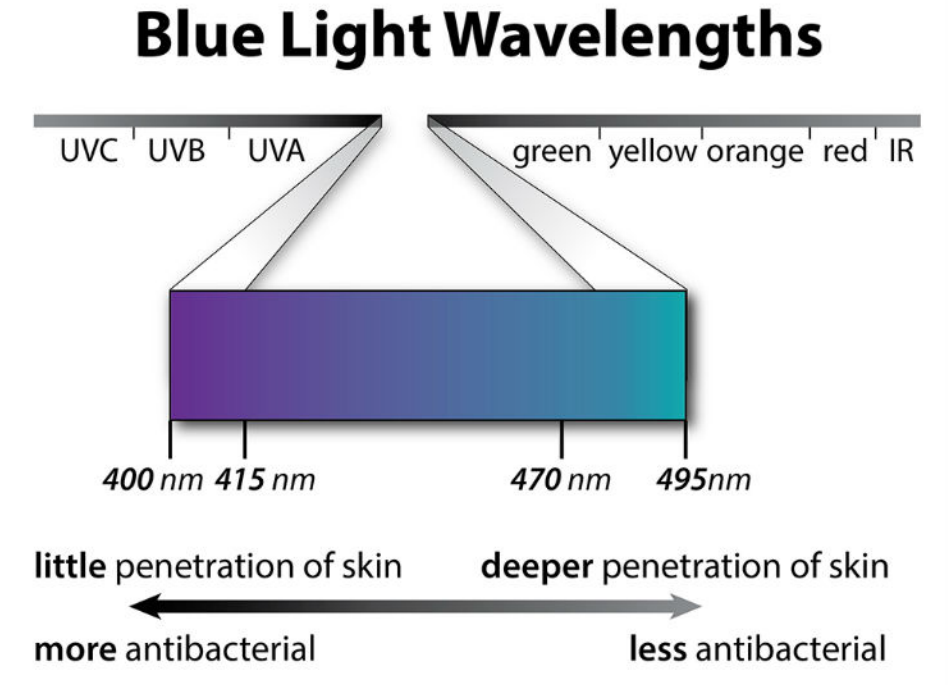
DAMAGE FROM BLUE LIGHT WAVELENGTHS AND PREVENTION

Blue light has been the subject of many academic and research journals in the last twenty years. Blue light has been responsible for the initiation of virtually all oil types globally in foods that cause rancidity. In addition blue light has been studied for its adverse effect on sleeping patterns in European countries and the need for lamps that filter out the blue light wavelengths that damage these patterns. Now we have proof blue light is damaging our eyes from the devices we use in our daily lives.

The good news we have a solution to the problem. UVITA SME 3811 and Maxgard 2000 series both eliminate the damaging blue light wavelengths from 400 to 495 nm. In addition

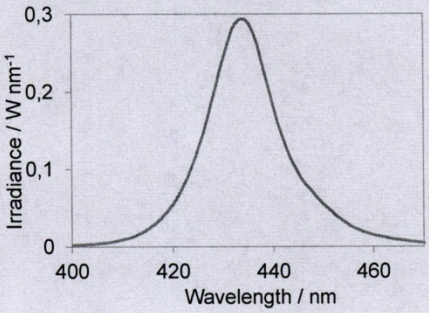


Blue light and chemical bonds

E_{440nm} = 260 kJ / mol

E_{420nm} = 275 kJ / mol

E_{400nm} = 290 kJ / mol



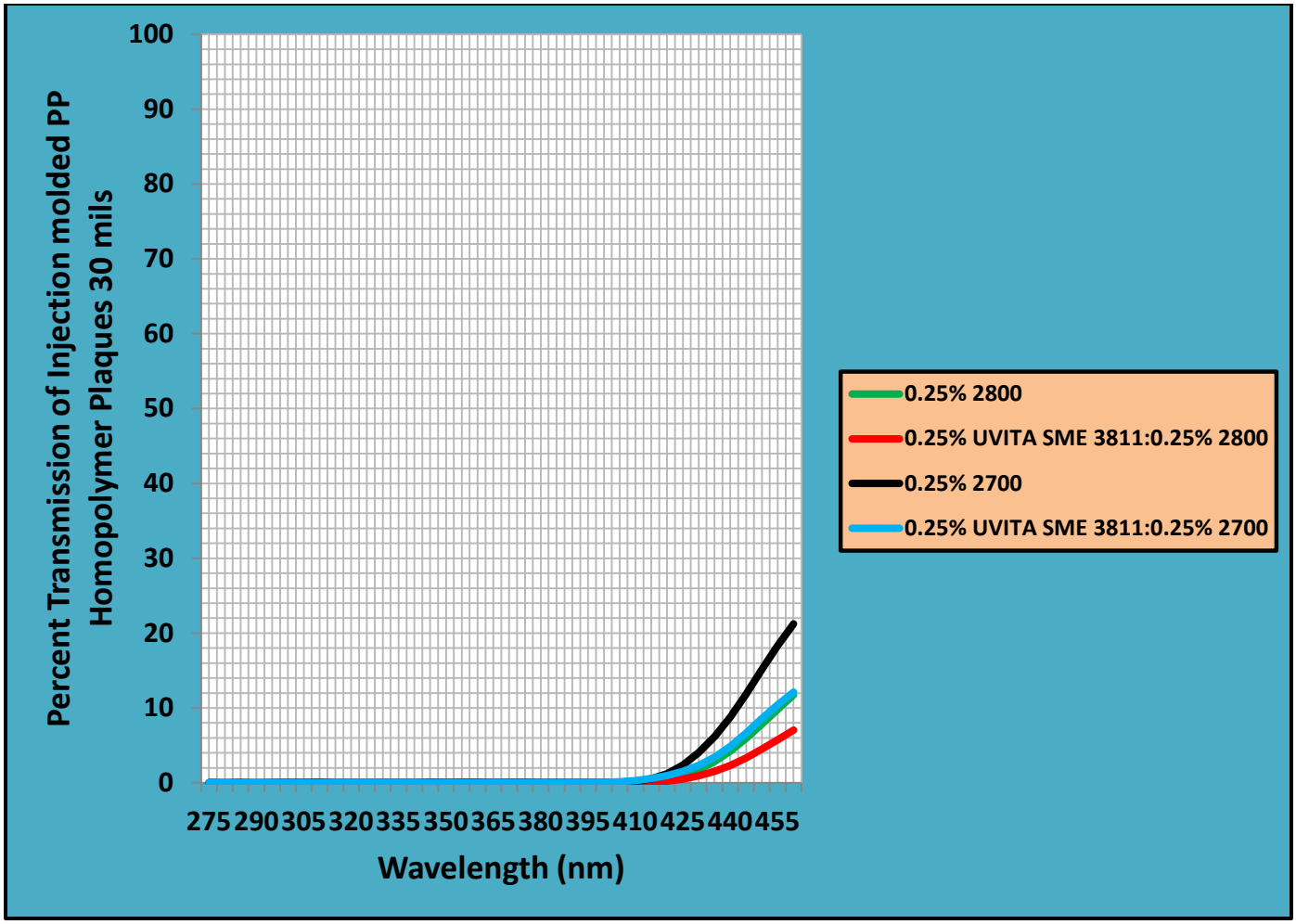
Optical spectrum of a blue LED

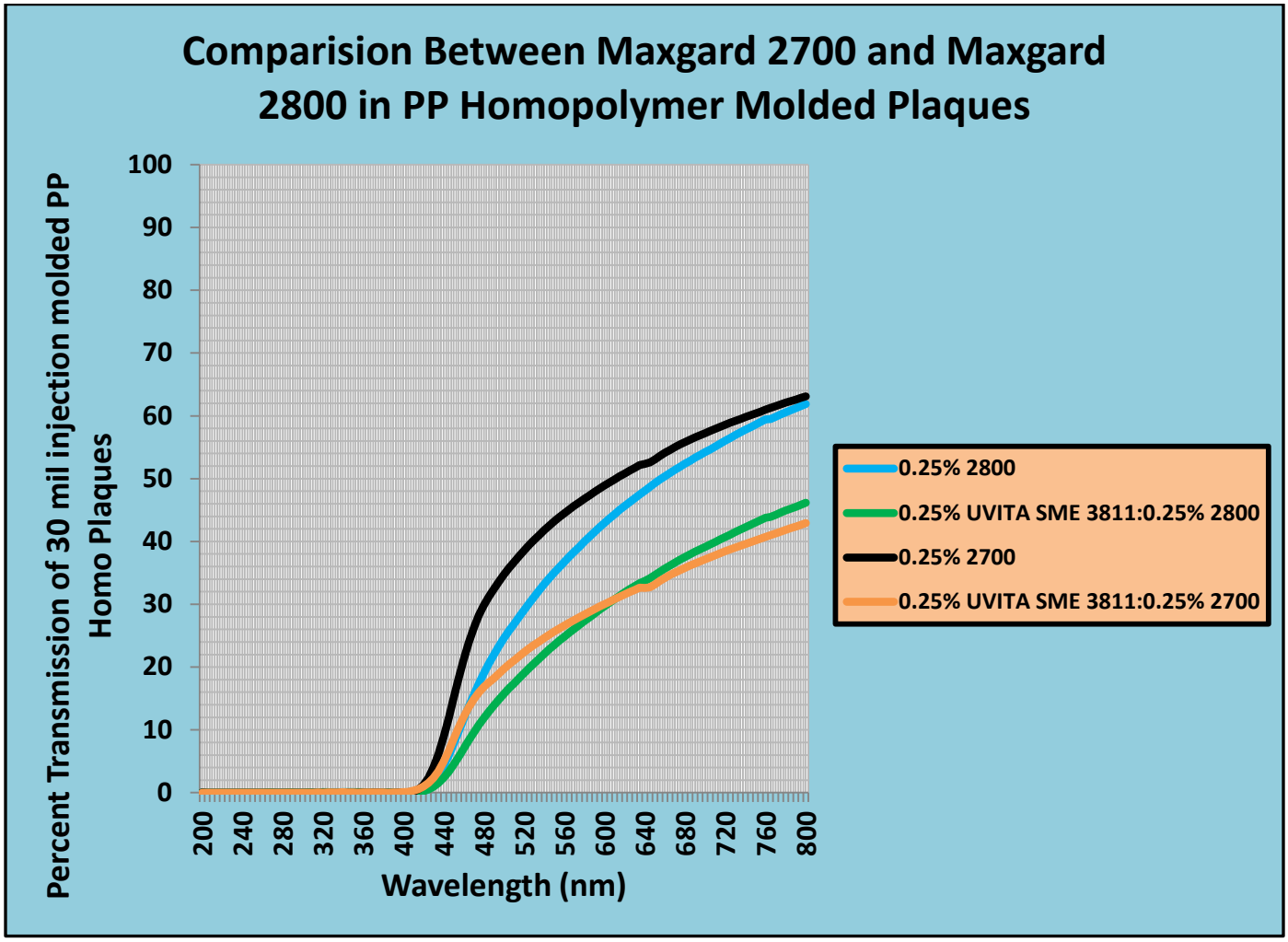
C-C: 350 kJ / mol

C-H: 420 kJ / mol

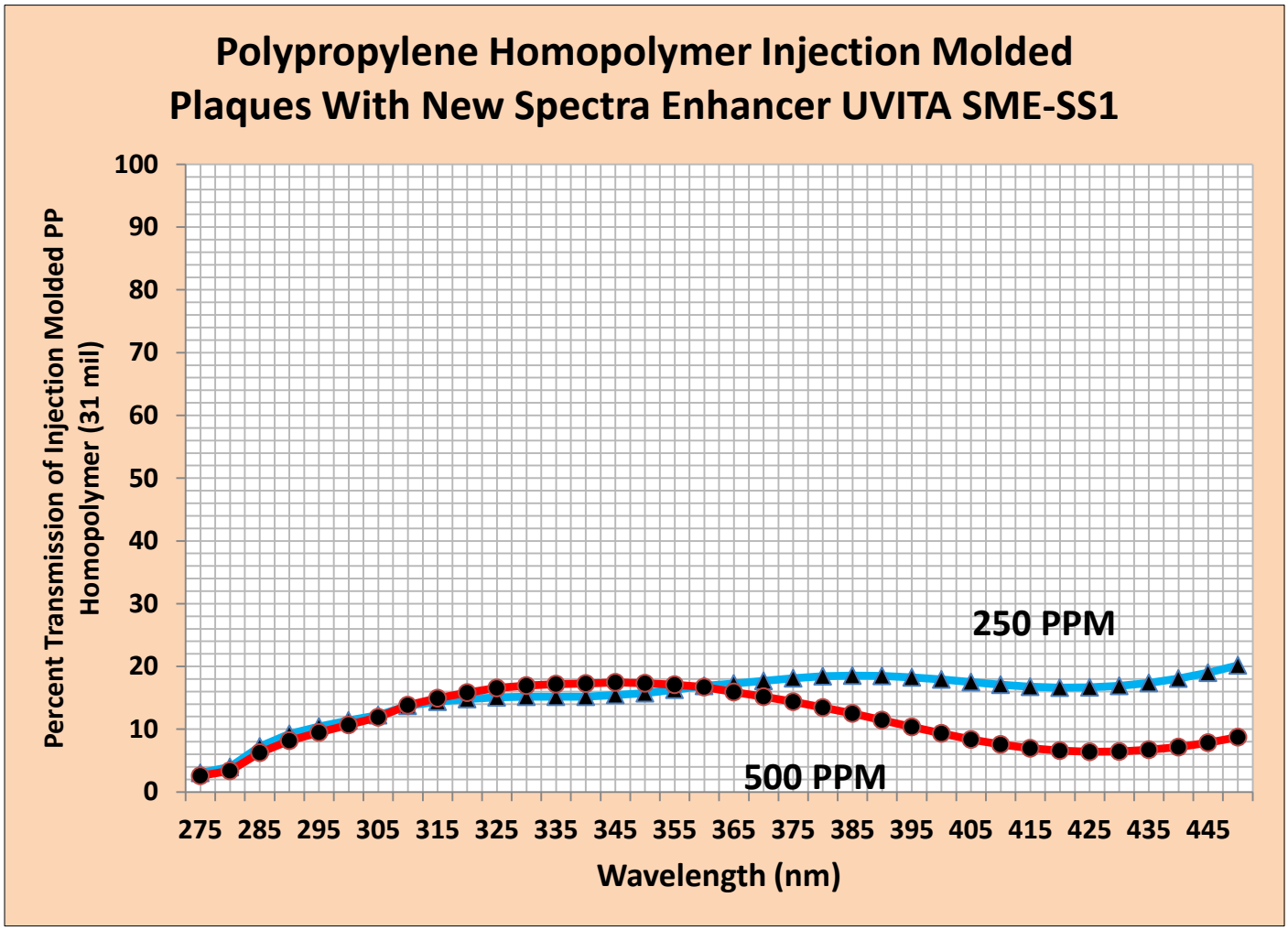
C-O-O-H: 270 – 290 kJ / mol (oxidation products, e.g. from injection molding)

⇨ Blue light can destroy chemical bonds in polymer chains




Comparision Between Maxgard 2700 and Maxgard 2800 in PP Homopolymer Molded Plaques
Percent Transmission of 30 mil injection molded PP Homo Plaques
100
90
80
70
60
50
40
30
20
10
0
200
240
280
320
360
400
440
480
520
560
600
640
680
720
760
800
Wavelength (nm)
0.25% 2800
0.25% UVITA SME 3811:0.25% 2800
0.25% 2700
0.25% UVITA SME 3811:0.25% 2700

NEW SPECTRAL ENHANCER UVITA SME-SS1:



COMBINATIONS WITH UVITA SME-3811 CHANGES THE SPECTRA AND BROADENS THE ABSORBANCE OF WAVELENGTHS. THIS PROVIDES A TRANSPARENT MATERIAL AND BY VARYING THE CONCENTRATION ALONE DECREASES TRANSMISSION OF BOTH THIN AND THICK SECTION POLYMERS.

LATEST ARTICLE:

Chemists discover how blue light from digital devices speeds blindness

Date:
August 8, 2018
Source:
University of Toledo
Summary:
Blue light from digital devices and the sun transforms vital molecules in the eye's retina into cell killers, according to optical chemistry research.

Share:
FULL STORY

Blue light from digital devices and the sun transforms vital molecules in the eye's retina into cell killers, according to optical chemistry research at The University of Toledo.

The process outlined in the study, which was recently published in the journal *Scientific Reports*, leads to age-related macular degeneration, a leading cause of blindness in the United States.

"We are being exposed to blue light continuously, and the eye's cornea and lens cannot block or reflect it," Dr. Ajith Karunarathne, assistant professor in the UT Department of Chemistry and Biochemistry, said. "It's no secret that blue light harms our vision by damaging the eye's retina. Our experiments explain how this happens, and we hope this leads to therapies that slow macular degeneration, such as a new kind of eye drop."

Macular degeneration, an incurable eye disease that results in significant vision loss starting on average in a person's 50s or 60s, is the death of photoreceptor cells in the retina. Those cells need molecules called retinal to sense light and trigger a cascade of signaling to the brain.

"You need a continuous supply of retinal molecules if you want to see," Karunarathne said. "Photoreceptors are useless without retinal, which is produced in the eye."

Karunarathne's lab found that blue light exposure causes retinal to trigger reactions that generate poisonous chemical molecules in photoreceptor cells.

"It's toxic. If you shine blue light on retinal, the retinal kills photoreceptor cells as the signaling molecule on the membrane dissolves," Kasun Ratnayake, a PhD student researcher working in Karunarathne's cellular photo chemistry group, said. "Photoreceptor cells do not regenerate in the eye. When they're dead, they're dead for good."

Karunarathne introduced retinal molecules to other cell types in the body, such as cancer cells, heart cells and neurons. When exposed to blue light, these cell types died as a result of the combination with retinal. Blue light alone or retinal without blue light had no effect on cells.

"No activity is sparked with green, yellow or red light," Karunarathne said. "The retinal-generated toxicity by blue light is universal. It can kill any cell type."

The researcher found that a molecule called alpha tocoferol, a Vitamin E derivative and a natural antioxidant in the eye and body, stops the cells from dying. However, as a person ages or the immune system is suppressed, people lose the ability to fight against the attack by retinal and blue light.

"That is when the real damage occurs," Karunarathne said. The lab currently is measuring light coming from television, cell phone and tablet screens to get a better understanding of how the cells in the eyes respond to everyday blue light exposure.

"If you look at the amount of light coming out of your cell phone, it's not great but it seems tolerable," Dr. John Payton, visiting assistant professor in the UT Department of Chemistry and Biochemistry, said. "Some cell phone companies are adding blue-light filters to the screens, and I think that is a good idea."

To protect your eyes from blue light, Karunarathne advises to wear sunglasses that can filter both UV and blue light outside and avoid looking at your cell phones or tablets in the dark.

"Every year more than two million new cases of age-related macular degeneration are reported in the United States," Karunarathne said. "By learning more about the mechanisms of blindness in search of a method to intercept toxic reactions caused by the combination of retinal and blue light, we hope to find a way to protect the vision of children growing up in a high-tech world."

Story Source:

Materials provided by **University of Toledo**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Kasun Ratnayake, John L. Payton, O. Harshana Lakmal, Ajith Karunarathne. Blue light excited retinal intercepts cellular signaling. *Scientific Reports*, 2018; 8 (1) DOI: 10.1038/s41598-018-28254-8

University of Toledo. "Chemists discover how blue light from digital devices speeds blindness." ScienceDaily. ScienceDaily, 8 August 2018. <www.sciencedaily.com/releases/2018/08/180808093907.htm>.