Contamac's Yellow Hydrophilic Acrylic IOL Material

There has been much debate about the relationship between blue light and macular degeneration, in patients who have had cataract surgery. Some studies conducted have found a correlation and many surgeons are opting to use blue blocking lenses in favour of clear intraocular lenses. In response to this trend in the market, Contamac has developed a yellow version of its market leading CI26 hydrophilic intraocular lens material. This material has excellent blue light absorbing properties that compare well with the crystalline lens.

The use of blue light absorbers in the fabrication of intraocular lenses (IOLs) was first suggested in a number of patents that were filed in the late 1980's. These patents discuss the benefits of yellow IOLs, since they provide a visual outcome that replicates more accurately the natural crystalline lens. The subject matter of such patents was the incorporation of yellow colouring agents in IOLs that were fabricated from PMMA. Unfortunately, such yellow IOLs met with limited commercial success.

More recently, IOL manufacturers have suggested the use of yellow lenses to help prevent age related macular degeneration, in patients who have had cataract surgery. The re-introduction of this concept with greater perceived clinical benefits has resulted in these types of lenses gaining favour in recent years. Blue light absorbing IOLs are now available in a number of moulded products including silicone and foldable acrylic materials. However, hydrophilic materials have to date not been available with a blue light absorber, resulting in many manufacturers not being able to provide these lens types.

Since PMMA is a hard glassy material, the colouring agents are not able to leach from the material. This is an important consideration since almost all the colouring agents suggested in early patents, did not contain a polymerisable group. With the development of IOL materials suitable for small incision surgery, it becomes vital for additives to be chemically bound to the polymer material. For quite some time, UV absorbers, which contain polymerisable groups, have been used in the production of IOL materials. Yellow colour additives to be used in such materials also need to contain a polymerisable function, to ensure that the yellow colour does not migrate from the material.

The development of a blue light absorber for hydrophilic materials has presented a range of challenges. It is vital that a colour additive for such materials is chemically bound to the polymeric backbone of the material. Otherwise, the additive can leach out of the material when it becomes swollen with water in its hydrated state. It is also important that the lens absorbs light of correct wavelength. Although a lens may be yellow in appearance, it may not actually be absorbing the light as would be expected.

Bearwalden Business Park, Saffron Walden, Essex, CB11 4JX, United Kingdom
Telephone: +44 (0)1799 542000 ~ Fax: +44 (0)1799 543000
www.contamac.com

Contamac has developed a yellow colour additive that meets these criteria and is suitable for use in hydrophilic IOLs. The additive contains a polymerisable group that ensures it can be fully incorporated as part of the polymeric backbone. As a result, the yellow colour does not leach from the material when the lens is hydrated. The resulting lens will also absorb light of suitable wavelength, closely matching the transmittance spectra of other commercially available, blue light absorbing IOLs.

It is important to ensure that the yellow colour is stable, particularly with respect to long term exposure to sunlight. The long term photosensitivity of the blue light absorber, can be evaluated by conducting an accelerated aging study. This will replicate the equivalent of 20 years of exposure for an average person and condense it into a relatively short term experiment by use of light with a greater intensity than the sun. Such studies are performed according to a specific ISO standard for the photostability of IOLs. This standard estimates the actual amount of light of potentially damaging wavelengths, which reaches the IOL on a daily basis. The duration of the study is largely dependent on the intensity of the light source used for the experiment. The light transmission properties of the lens are evaluated before and after the testing, and the lens is also examined by microscope to determine if there have been any changes to the material.

Figures 1-3 show the light transmittance curves for three different blue light absorbing IOLs that have been subjected to photostability testing. Figure 1 shows the light transmission properties of an IOL produced from the yellow version of CI26. The graph shows a relatively slight change in transmission properties of the lens after simulation of 20 years wear. Figures 2 and 3 show the light transmission properties of other commercially available blue light absorbing IOLs. For both of these products there is a decrease in the blue light absorbing properties, after the simulation of 20 years wear and this is greater than the change seen in the Contamac material.

The development by Contamac of a yellow version of its hugely successful CI26 material, represents a major step forward for IOL manufacturers. A range of IOL designs can now incorporate protection against age related macular degeneration, without compromise on the quality of the underlying hydrophilic material.

Bearwalden Business Park, Saffron Walden, Essex, CB11 4JX, United Kingdom
Telephone: +44 (0)1799 542000 ~ Fax: +44 (0)1799 543000
www.contamac.com

Figure 1 – Light transmission properties of CI26 Yellow

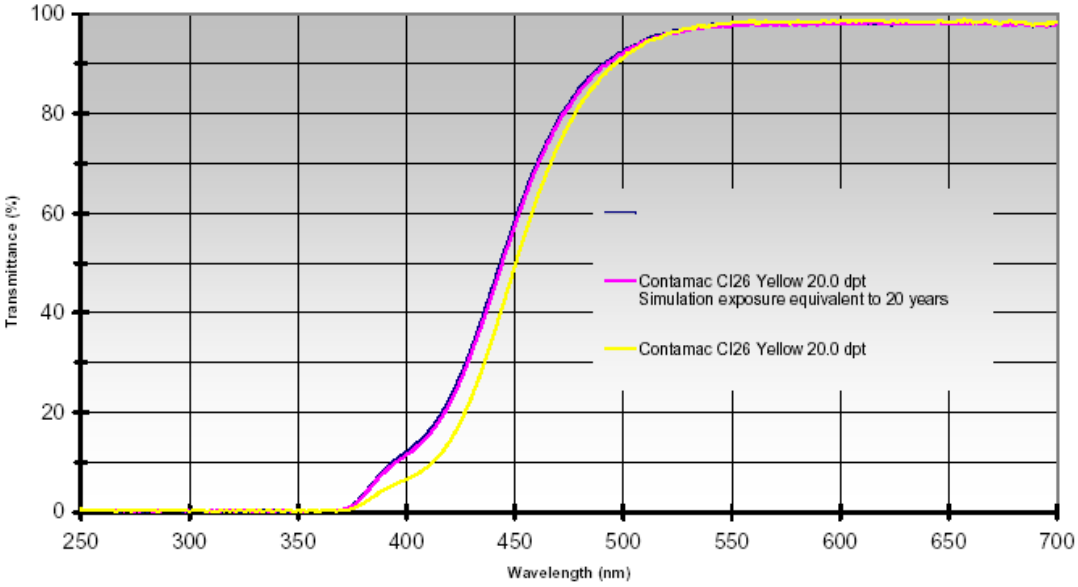
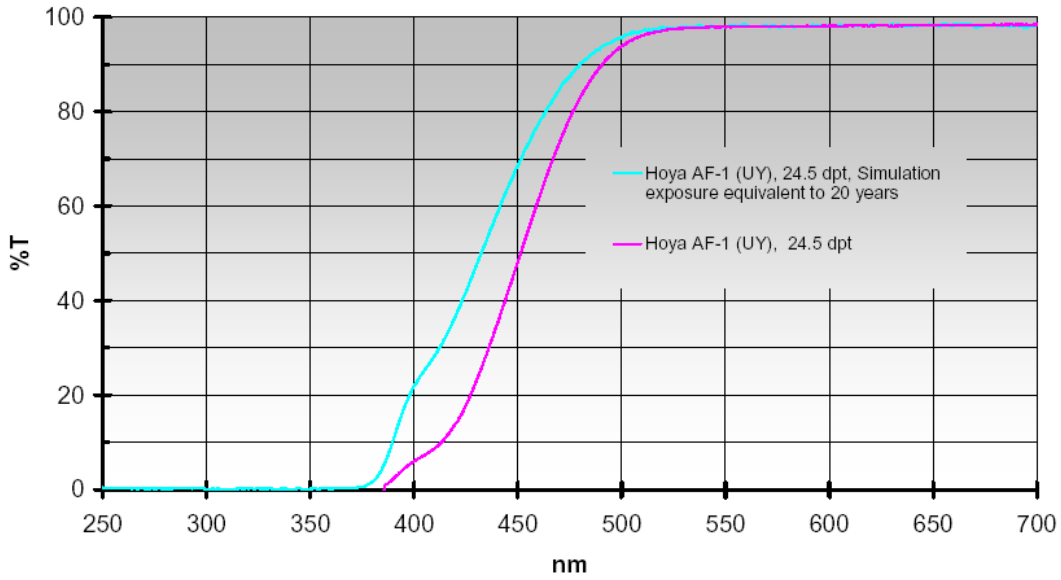


Figure 2 - Light transmission properties of Hoya AF-1 (UY)



Bearwalden Business Park, Saffron Walden, Essex, CB11 4JX, United Kingdom
Telephone: +44 (0)1799 542000 ~ Fax: +44 (0)1799 543000
www.contamac.com

Figure 3 - Light transmission properties of Acrysof Natural SN60AT