Surprising Absorption Properties of the UVA Filter Neo Heliopan® AP (INCI Disodium Phenyl Dibenzimidazole Tetrasulfonic Acid)

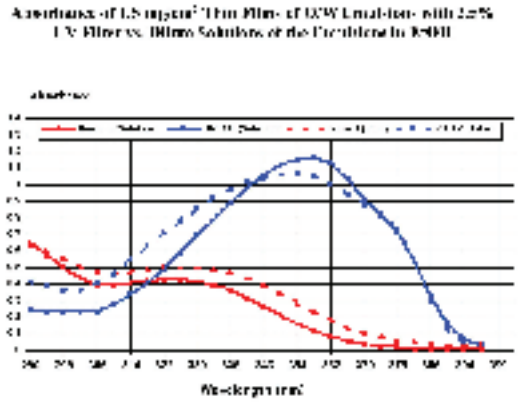
Dr. William Johncock. Symrise GmbH & Co, Germany.

In this paper we would like to present some very surprising observations relating to the absorbance properties of the UVA filter Disodium Phenyl Dibenzimidazole Tetrasulfonic Acid, trade name Neo Heliopan® AP [1]. We believe that these observations may explain the better than expected performance of the filter in in-vivo efficacy studies using the persistent pigment darkening (PPD) technique [2].

Dilute Solution vs. Thin Film Spectra

The absorbance profile of emulsions containing 2.5% of UV filters in dilute alcoholic solutions, in which the concentration of UV filter in the solution is about 0.001% (400mg emulsion per litre of ethanol equivalent to 10mg/l of UV filter), are very similar to those obtained from thin films (15μ) of the emulsion spread onto a profiled UV transparent support (ground quartz glass) . This is illustrated by comparing the spectra obtained from the UV filters Butyl Methoxydibenzoylmethane (BMDM), trade name Neo Heliopan® 357 [1] and Benzophenone-3, trade name Neo Heliopan® BB (Figure 1). The thin film spectrum of BMDM has a slightly lower extinction at the lambda max compared to the dilute solution and also has a slightly higher absorbance in the UVB. The shape of the two Neo Heliopan® BB absorbance curves are virtually identical, with the amplitude of the thin film spectrum being higher than that obtained for the solution.

Figure 1.



It was therefore expected that a dilute ethanolic solution of an emulsion containing 2.5% of Neo Heliopan® AP would have a similar absorbance profile in both dilute solution and in a thin (15μ) film. In dilute solution, Neo Heliopan® AP, whether neutralised to pH 7.0 with TEA or NaOH, has a UV absorbance above 0.2 units from 300 to 365 nm with a maximum absorbance of 0.8 at 335nm. However in a thin film (Figure 2) the shape of the absorbance curve is significantly altered, with the lambda max occurring at longer wavelength with a strongly absorbing tail being observed above 365 nm. Unlike the dilute solution, the extent of the shift is dependent upon the base used to neutralise Neo Heliopan® AP (TEA or NaOH). The TEA salt has a shoulder from 365 to 370 nm with the absorbance tailing off at 380 nm, whereas the Na salt does not exhibit this shoulder but it has an absorbance which tails off at 390 nm. In effect the shape of the curves are very different indicating that the differences in absorbance are not artifacts caused by concentration effects.

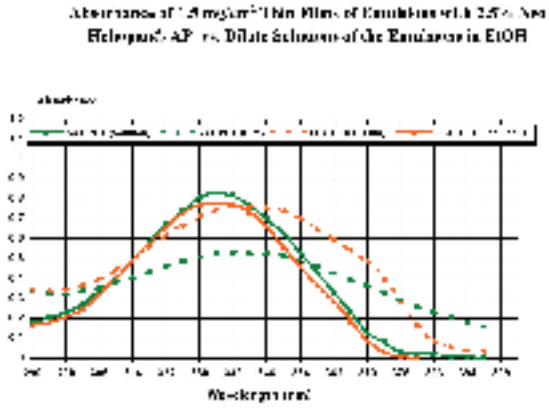


Figure 2.

We have also observed that significant differences in the absorbance spectra of thin films (15μ) of emulsions containing Neo Heliopan® AP are observed when the emulsifier of the emulsion is changed.

In oil in water emulsions containing 5% of the UVB filter Ethylhexyl Methoxycinnamate (Neo Heliopan® AV) and 2.5%