Whitening Enhancement of Fabrics by a Polymeric Whitening Enhancer Technology with a Blue Chromophore
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The addition of a polymeric whitening enhancer with a blue chromophore to the washing powder enhances the whiteness of yellowed and faded textiles. A polymeric whitening enhancer technology with bentonite as carrier causes a homogeneous deposition of the hueing dye that absorbs in the complementary wavelength of yellow resulting in a white appearance of the fabrics. The perceived whiteness is obtained on all fabrics after only one wash cycle giving no build up of the hueing dye after multiple cycles.

Abstract

Whitening Effect by Fluorescing Agents

Laundered and bleached textiles have after cleaning and bleaching without the addition of an optical brightener a yellowish tint. A fluorescent whitening agent (FWA) is deposited during the laundering process on the surface of textiles and emits the in the UV range at < 400 nm absorbed light by fluorescence in the visible range covering the yellowish tint by an additive whitening effect (Fig. 1).

Whitening Effect by Complementary Dyes

Yellowing and white-off of white worn clothes can be eliminated by subtractive whitening through the addition of a blue dye that absorbs in the complementary wavelength of yellow. The whitening effect is independent from the optical brightener as the polymeric whitening enhancer subtracts the fabric’s absorption of yellow (Fig. 1 and 2).

Polymeric Whitening Enhancer QUEST® P.W.A.

AMCOL has developed the polymeric whitening enhancer QUEST® P.W.A. on base of a polymeric whitening enhancer technology with bentonite as the carrier material containing a bright blue-violet dye which behaves complementary to yellow so that...
the yellowing of the textiles is eliminated by subtractive whitening. Its structure is shown in Fig. 3. The polymeric whitening enhancer QUEST® P.W.A. is available in the form of granules with an average particle size of 500 to 600 µm, a bulk density of 100 to 900 g/l and a moisture content of 12 to 15%.

The application concentration amounts from 0.5 to 2.5 ppm in the washing liquor, which equates from 0.3 to 3.5% of QUEST® P.W.A. Immediately after the first wash an effective whitening effect will be achieved. The impact is independent from an optical brightener or a bleaching agent. No build-up of the bluing dye of the polymeric whitening enhancer occurs after multiple cycles, even after repeated washing cycles.

The polymeric whitening enhancer is compatible with the usual ingredients of laundry detergents and can be added together with other ingredients, e.g. enzymes, bleaching agents and catalysts to the detergent powder without causing any bleeding or staining of the bluing dye from the particles.

■ Impact of the Tint Value on the Whitening Effect

The perceivable intensity of optically brightened samples is determined by the physiologically observed white in the dominant wavelength of 470 nm as well as by a color deviation. Therefore the neutral white at 470 nm will be specified with a tint value.

The standard color values of the CIELAB system L*, a* and b* are based on three metameric color valences in the three-dimensional space (Fig. 4). L* is a measure of brightness, a* of green, a+ of red, b- of blue and b+ of yellow. Delta b results from the difference between the b- value after wash without containing QUEST® P.W.A. and the b-value after wash with QUEST® P.W.A. Delta b is indicative of polymeric whitening enhancer deposition. If Delta b is > 0.2, an untrained eye can detect color difference of fabric. Equal Delta b values represent equal change in visual appearance.

Fig. 5 shows the whitening effect that occurs by the addition of QUEST® P.W.A. to the washing liquor, when measuring the tint value (Delta b) on cotton laundry with a concentration from 0.25 to 1.0 ppm after one and after five washing cycles. The after the first washing cycle immediately occurring enhancement of whiteness persists after the fifth washing cycle in the same range. Similar
performance of the whitening effect results also for fibers of polyester, lycra and nylon.

In Fig. 6 the results of measuring the whiteness enhancement in a series of tests over 25 washing cycles are shown. Compared to a laundry detergent with a load of 5 ppm polymeric whitening enhancer no whitening effect is obtained without the addition of a polymeric whitening enhancer or without an optical brightener (OB). On the contrary, it leads to a yellowing of the fabric resulting in a negative Delta b. In contrast, by the addition of QUEST® P.W.A. the whiteness increases with increasing numbers of washing cycles. In combination with an optical brightener after five washing cycles a synergistically enhanced whitening effect occurs, which will be intensified in further washing cycles.