

Yellowing reactions

The effect of contact yellowing is very familiar. It refers to partial yellowing of the reverse side of the paper at points where the printed image comes into contact with the unprinted reverse side in the stack.

The same causes, however, can also lead to yellowing effects in the printed image itself, effects that can cause considerable colour shifts in the yellow region, for instance a shift from pink to apricot or from green to yellowish green. These shifts are often interpreted as a lack of light fastness, but they also arise in the stack under total exclusion of light.

Above all, yellowing effects become visible in printing varnish and in pastel tones. They occur in all oxidative-drying inks and varnishes, but are not visible in intensive colour tones. The following mechanisms are responsible for these effects:

- Decomposition products that inherently have a slight yellow colour always arise during oxidative drying. During the drying process in the stack, these decomposition products penetrate the surface of the substrate and cause not only yellowing of the printed surface but also contact yellowing (described above) of the unprinted reverse side of the sheet of paper lying on it.
- The drying process leads to a change in the colour of the oxidative-drying oils and alkyds that have anyway an inherent weak yellowish tint. This inherent colouring becomes more intensive and the yellowish tone intensifies.
- The decomposition products produced during oxidative drying react with the optical brighteners contained in the paper coating, rendering them "ineffective", and the substrate surface loses whiteness. This effect is highly visible under UV light, with printed areas no longer demonstrating the typical fluorescence of the optical brighteners.

The intensity of this yellowing therefore depends greatly on the quantity and quality of the decomposition products and consequently on the formula of the printing ink.

UV inks and varnishes are obviously not subject to oxidative drying and therefore do not produce any decomposition products. This means we can refer to them as being "yellowing-free". Furthermore, UV varnishes are transparent and clear even when applied in a thick film.

As a hard and fast rule, organoleptically neutral inks also do not dry by oxidation and therefore produce no or just a very small amount of decomposition products. Their tendency to yellow is very slight. Yellowing can be optimised by selecting special raw materials with little inherent colour. Products categorised as low in hexanal also demonstrate very good characteristics with regard to yellowing. However, these inks can not be used in all cases due to their lack of rub resistance.

If your rub resistance requirements demand that the ink film to be formed must be mechanically stable and therefore demand oxidative drying, it is not possible to rule out a certain degree of yellowing. When formulating pastel tones, you must then take great care when choosing the oxidative-drying components and the quantities of these components.

Transparent white

40 HGA 0550 Can only be used if overvarnished with dispersion varnish.

235498 Can also be used without dispersion varnish.
Yellowing is, however, more pronounced than with 40 HGA 0550.

When it comes to formulating printing varnish, the amount of freedom you have is usually quite limited because you have – on preprinted ink and with high demands with respect to rub resistance and usually gloss, too – to rely on distinctly oxidative drying. The only yellowing-free alternatives available are dispersion varnish and inking-unit varnish. The inks, however, must have the required fastness properties.

The extent of yellowing depends heavily on the composition of the paper coating, that is, on the grade of paper. Common grades of board generally contain optical brighteners to increase their whiteness.

The tendency of systems (substrate and ink) to yellow can be tested in a lab test. We will gladly provide you support in conducting such a test and can advise you when you choose suitable alternatives.