

Interference Effects for innovative Designs

The more ordinary and exchangeable goods become, the more important it is, to add certain attention factors, as for example visual effects, to the products and their packaging, in order to set them apart from others. Designintegrated effects with the current Interference Inks of Printcolor provide everything you need to make your product looking unique.

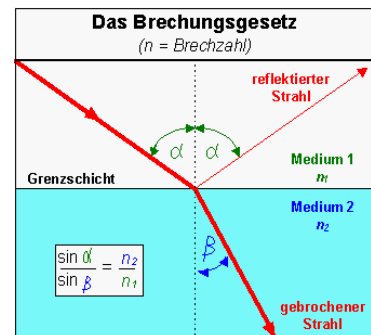
Seduction for touching

From the elegant glimmer of a pearl through to the subtle gliding play of colors of a rainbow right up to the strong color flop Interference Inks provide again and again surprising visual experiences. The extraordinary color intensity and the appealing play of colors seduce to take objects into the hands, to move them, in order to discover new nuances. The fascinating interference effects can be implemented with astonishing little effort especially with the screen printing technology and belong therefore in every catalogue of services of each committed establishment.

Evolution of the Interference Effect

If rays of light impinge on an object, different incidences can take place. On the one hand the rays of light can penetrate into the object and getting through it unaltered, whereby we speak of transmission. Another possibility is that rays of light are spread at the object. The all sides deflection is called light scattering. Generally light scattering is differentiated in refraction and reflection. At the reflection the ray of light does not penetrate into the pigment, but is reflected at the interface / surface. At the light refraction the ray of light penetrates into the pigment and is deflected in there. As last possibility the light can be absorbed at hitting on an object. In most cases several incidences together provide the observable color impression. At superimposed, optically effective layers it comes to a reflection of different wavelengths which superimpose each other.

The expression „Interference“ is understood as the totality of superimposed appearances of two or several waves (manifold reflection) especially in thin layers.



The Pearl as Mother of all Interferences



Natural pearls grow in sea shells after a foreign matter has entered the shell. As defense reaction the shell encapsulates the foreign matter by enveloping the same interchangeably with sheer layers of proteins and calcium carbonate. If rays of light hit on the pearl, so the first layer is reflecting one part of the light, but let pass the bigger part.

After pervading of the likewise transparent protein layer the ray of light hits on the surface of the second calcium carbonate layer, where once again one part will be reflected but the bigger part being passed. After many reflections the characteristic shine of pearls arises. Interference colors can be recognised on many things of the daily life: liquids on the road, soap bubbles, butterfly wings, some beetles and certain minerals show this effect in a spectacular way.

Different kinds of Interference Pigments

The classical **pearlescent pigments** consist of colorless, transparent flakes. If you apply a very thin layer of for example a titanium dioxide on this substrate (mica), so you will get silver-white shining flakes. These and the following colorants are generally called Layer-Substrate-Pigments.

Other agents of the class of interference pigments are the **metal oxide pigments**. They consist of thin, transparent mica flakes (substrate), which are enveloped with micros of millimeters thin layers of highly refractive metal oxides as TiO_2 or Fe_2O_3 (layer). Depending on the constitution of the pigments silver-white to colored, reddish to copper or golden color shades show up. With further variations of the coating and the assignment of various substrates the pigments can be affected in their reflecting color additionally.



If metallised substrates are used instead of the classical substrates, **hologram pigments** can be achieved. Because of the variable processing steps at the manufacturing of these metallic interference pigments meanwhile a variety of subassemblies have been created. According to the rule of thumb „the finer, the more expensive“ ultra fine, chromatic shining interferences are certainly reserved for very exclusive applications, whereas the coarser effect pigments of the category have already found copious distribution.

By combination of most diverse substrates as glass, plastics and metal with a refined coating technology continuously new interference pigments with new or improved optical characteristics are created. Also the application of completely new technologies have already taken place successfully.

This new generation of interference pigments does not anymore base on the Layer-Substrate principle but consists of tiny encapsulated **liquid crystals**. These very costly manufactured pigments show an intensive color flop, which can be sharply delimited depending on the viewing angle. Certain versions of these pigments are used exclusively as OVP („optically variable pigments“) in special Printing Inks (OVI) for the high-security print. Other versions are limited commercially available and are used for applications with minor security requirements, mostly in combination with additional protection features or for especially high-quality packagings.



Optimal Effect Development

Condition for a characteristic interference effect is a preferably parallel positioning of the pigment flakes to the surface. If this is not the case, the light will not be reflected in one desired direction, but diffusely to all sides.

In loose powder form the pigment particles lie completely undirected altogether. Only while printing on a surface the flakes orientate in correlation with the binder and the volatile components of the screen printing ink parallel to the surface, because they are trying to oppose as minor resistance as possible against all horizontal flows.

Optimal Dispersion

In order to achieve this positioning effect, already at the dispersion of the pigments in the binder system a special technology has to be applied. The 4 processing steps wetting, dispersing, mixing and stabilizing of the pigments in the binder not only require a lot of experience but also the application of special surface-active additives. Printcolor sells therefore only Printing Inks which are ready to use and which are optimized under consideration of the chosen pigment quality.

The right Mesh Selection

The for the printing job applied mesh specification has to be adjusted to the current geometry of the pigment particles. The used flakes are defined according to an analysis of the particle sizes and the grinding of particles. The data D50 in percentage means, that 50% of the used pigment lies within or under the mentioned particle size in μm . But on the other hand it means also, that 50% are bigger. Therefore, in order to be able to evaluate the grinding of particles in total, the data D95 must be considered additionally to the correct indication of the D50 data. As rule of thumb a relation of 1:4 for normal colors and 1:2,5 for glitter effects is used in the screen printing. The open area of the mesh has to be 4 respectively 2,5 times bigger than the D50 data, if a separation of the pigments in the binder shall be avoided during the continuation of the printing process. If there is a major difference between the D50 and the D95 data, the relation to the mesh has possibly to be rectified. It is very advisable, to follow the mesh recommendations in the Printcolor product documentation, because it is based not only on theoretical calculations but also on extensive practical experience.

The right Design

A careful planning and integration in a design is deciding for a convincing effect print. If you would like to achieve a partial effect with a coarse hologram glitter varnish, the for the ink transfer required coarse mesh sets natural limits to the detail fineness. In order to support an optimal pigment positioning it is absolutely necessary to print closed, smooth surfaces. Absorbing or massively structured surfaces have, in case of doubts, to be made even first with a pre-print. Almost all interference inks are not opaque. The color intensity of the underground is always influencing the end result. Coarse interferences and especially OVP have to be printed on black underground, in order to achieve a good play of colors. The mixing of diverse interference pigments according to the motto „even more is even nicer“ is absolutely taboo. The various interferences of the pigments do not add to new, interesting colors but erase each other completely. The result is a grey-white, quite boring appearance.



The admixture of transparent colors is nevertheless possible and useful in most combinations. Especially suitable are the highly transparent colors of Printcolor, which are visualized perfectly in the HT-Color Chart (Series 10-37/HT). The most fascinating results you will get by consideration of all technical possibilities and exact matching to the motive in a holistic concept. The central technical department of the Printcolor Group will be happy to help you with words and deeds to achieve optimal realizations of innovative designs.

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Printcolor Effect Printing Inks for new possibilities in advertisement and design!