

Measurement of Nail Polish

Nail polish can be transparent, translucent or totally opaque. By adding metallic or interference pigments fascinating effects can be achieved. In order to guarantee consistency, a routine quality control system needs to be established. Key component is one binding reference with realistic tolerances, which allows evaluating batch to batch variation. In order to obtain repeatable results, standardized sample preparation is crucial.

Measurement of nail polish on test charts

An easy and quick test method for nail polish is applying a thin film on a black and white chart. In order to create a uniform drawdown, the following points are of importance:

- Influence of substrate
- Wet film thickness applied
- Uniform film thickness

The use of BYK-Gardner byko-charts, drawdown cards, guarantees consistent color and gloss of the substrate ensuring that the measured color difference only comes from product variations. Applying opaque nail polish on black and white charts also allows evaluation of opacity (hiding power).



For uniform application and good pigment orientation wire bars are the best choice. The choice of wire bar and therefore, wet film thickness depends on the mean particle size of the pigment. Selecting the wet film thickness close to the mean particle size will avoid a disorientation of the pigments and force the particles to orientate parallel, which will be close to the final application method by brush. The visual result will be similar to the final application on fingernails.

A uniform film thickness can be best achieved by using an automatic film applicator. Draw down speed and pressure on the applicator tool will always be the same. During routine quality control only measurement results of drawdowns using the same wire bar size should be compared. If however color and effect measurements of a wide variety of particles needs to be compared, drawdowns should be made with varying film thickness. The reason is that a difference in particle size as well as particle thickness will result in a different particle mass i.e. loading degree, opacity level and viscosity. Hence, for each pigment class the optimum film thickness should be determined according to their optimum visual performance prior to comparing measurements.

Measurement of nail polish on artificial fingernails

A classic QC method for final color and effect inspection is to compare the colors on the two thumbnails, holding them side by side. As this test result can only be evaluated visually, the use of artificial acrylic nails is an alternative method, which can be easily standardized.

The challenge for instrumental color and effect measurement is the small size and curved surface of the fingernails. Therefore, a color instrument with small aperture and a repeatable sample placement is required. BYK-mac i 12 mm together with the sample holder cosmetics and the nail kit (see page 23) is the ideal solution to guarantee repeatable results.

BYK-Gardner Solution



Solid Color & Gloss
spectro2guide



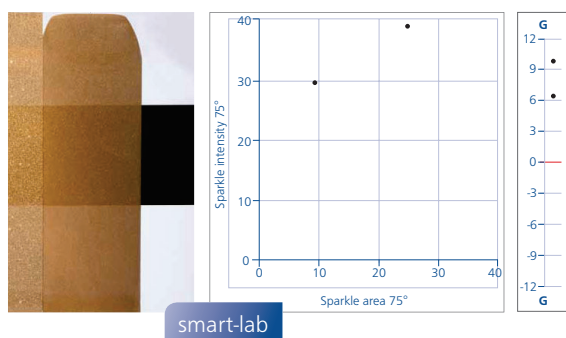
Multi-Angle Color & Effect
BYK-mac i



Gloss
micro-gloss

Comparison of two nail polish formulations

Not only does the application method influence the pigment orientation and hence, appearance, but also changes in formulation can create different looks. In the following example the same pigment was used in two different formulations. In formula 1 the flake orientation was not influenced. As a result it looks coarser and sparkles at a low grazing angle. In formula 2 the aluminum flakes were oriented parallel creating a fine, mirror-like look with hardly any graininess.



Data interpretation

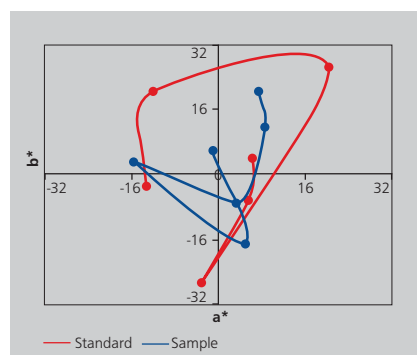
BYK-mac i effect measurements show clear differences. Graininess values and sparkle 75° values are significantly different. In case of severe disorientation of aluminum flakes, graininess as well as the sparkle area at 75° will be increased. The results agree very well with the visual evaluation.

Color travel of silver pearl nail polish

Depending on the pigment types used light-dark travel or color travel can be created when viewing at different angles. In case of interference pigments creating a color flop/travel the lightness and colorimetric data will change by viewing angle.



Two silver pearl nail polishes were measured with a BYK-mac i:



Data interpretation

The absolute L*, a*, b* graph displaying all angles in one diagram shows clearly the flop behavior (-15°, 15°, 25°, 45°, 75°, 110°) for the two products. The standard exhibits an extreme color flop with an interference line travelling through all four quadrants. It represents a color travel from yellow over red and green to blue.



Automatic Film Applicator
byko-drive



Drawdown Accessory
byko-charts & wire-wound rods



Artificial Nail Accessory
Sample Holder Cosmetics