RUBBER INDUSTRY COLOR CONTROL

COLOR CONTROL OF DISPOSABLE GLOVES

Disposable gloves are widely used by industries such as medical/healthcare, food, and automotive, for self-protection, contamination prevention, and hygiene purposes. Glove choice depends on job function, exposure to hazardous materials and skin sensitivities. Disposable gloves can be made from natural rubber latex or a synthetic elastomeric material, such as nitrile and vinyl. Besides the type of materials used, the overall performance of disposable glove is also affected by formulations and manufacturing processes resulting in different barrier integrity and in-use performance.

Looking back several years, disposable glove choices were limited and only a few colors were available. Latex and Vinyl gloves were either white or cream colored while nitrile gloves were typically blue in color. With the growing awareness on the importance of color coded gloves, glove color has now become an effective marketing tool, too.

Why color coding of gloves is important?

There are currently no standards, guidelines, or regulations regarding the color-coding of examination or surgical gloves in healthcare industry. However, traditionally, latex examination gloves are white or cream colored. Health care facilities that have not converted to a latex-free environment may prefer a colored (e.g., blue) synthetic glove to help staff easily differentiate between a latex glove and a non-latex glove, a preventive measure for the workers with latex allergy.

Within the medical industry, double layer glove with contrasting inner and outer color can be used to help identify glove failure. Alternatively, double gloving during surgical procedures, i.e., wearing a dark glove underneath a light one, or vice versa, can also help reveal punctures and small tears more easily, thus helps prevent surgical site infections. Some of the common contrasting colors used are yellow, black, blue, orange and green colors.

Task-specific colored gloves are used in laboratory and food industry for cross-contamination prevention and visibility. Segmenting an area of a laboratory by color of glove can prevent cross-contamination by easy identification of laboratory worker when they move from one area to another. Similarly, color coded gloves are also used in food industry to prevent cross contamination of raw and cooked foods during food handling by workers. In this way, workers and their supervisors can easily verify that they are using the right glove for quality critical processes.

In food processing industry, glove particles resulting from knife cuts can sometimes contaminate foods. Hence, using a glove with specially chosen color can make identification of such glove particles from the food products easier. For instance, you may want to have a darker color glove that stands out against whatever food product being prepared.

Color Control in the Glove Industry

Quality perception is often associated with consistency hence making color quality control an integral part of the

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gloves manufacturing process is important. The simplest method to assess the color of gloves is to perform the evaluation by eye. This is an important method, since the visual impression is one of the determining factors of what the customer will buy. However, visual evaluation has several limitations. Firstly, the color perception depends on the illumination, more specifically, the color of the light source. The sensitivity of individual's eye is slightly different, resulting in different color perception or ability to discriminate color difference. The human brain has also a limited ability to remember color and relate it to absolute values. For example, we can visually see different shade of red, but will have problem quantifying the difference.

CIE Color Spaces

Several methods for expressing color numerically were developed by the International Commission on Illuminant – abbreviated as CIE from its French title Commission Internationale d'Eclairage. The most widely known of these methods are the Yxy color space , devised in 1931 based on tristimulus values XYZ defined by CIE, and the L*a*b* color space , devised in 1976 to provide more uniform color differences in relation to visual differences. In the L*a*b* system, lightness is described by the L*, redness and greenness by a* and yellowness and blueness by b* (see fig. 1).

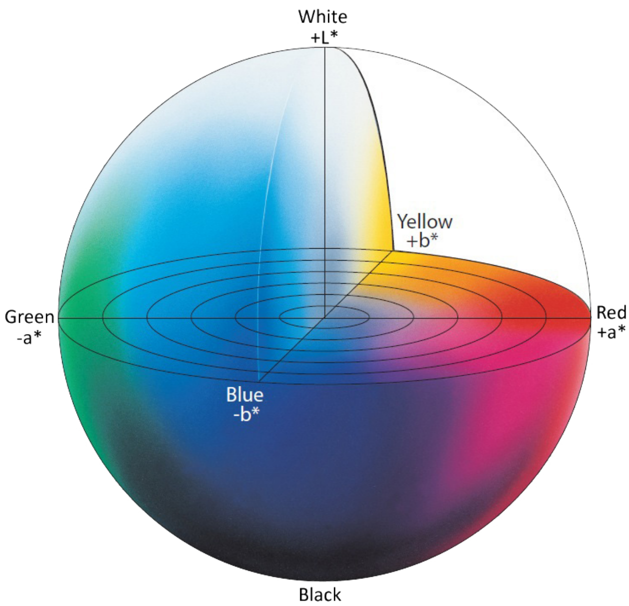

Fig (1) - Representation of color solid of L*a*b* color space

Color Measurement Instruments

Accurate and consistent color assessment is possible with color measurement instruments. With color measurement instruments, such as tristimulus colorimeters and spectrophotometers, objective color measurement, using scientific and standardized method, is possible. The purpose of instrumental color measurement is to implement an objective methodology in their workflow that eliminates subjectivity in color perceptions and color difference judgments.

A colorimeter (such as Chroma Meter CR-400) consists of a light source, fixed-geometry viewing optics, three photocells matched to an internationally established standard observer, and an on-board processor or cable connection to a processor/display unit or computer. Colorimeters are easy to deploy to production lines with straightforward and easy operation. Hence, colorimeters can be easily used by operators, instead of specialists, and are generally used in production and quality control applications.

Chroma Meter CR-400

A spectrophotometer uses many more sensors (40 or more in some spectrophotometers) to separate a beam of reflected or transmitted light into its component wavelengths. Besides provide colorimetric data in various color spaces, it also measures the spectral reflectance or transmittance of an object at each wavelength on the visible spectrum continuum and, hence, useful for evaluation of metamerism. Spectrophotometry provides high accuracy and is generally used in research and color formulation applications. Both bench-top (such as Spectrophotometer CM-3600A) and portable models (such as Spectrophotometer CM-700d) are available, with the former providing both reflectance and transmittance measurement.

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THE STANDARD IN MEASURING COLOR

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Spectrophotometer
CM-3600A

Spectrophotometer
CM-700d

By closely monitoring the consistency of color in production and processing operations using color instrumentation, glove industry have significantly reduced the cost of waste and product rejection while improving efficiency and productivity in their operations.

Measuring Method

As most disposable gloves are not fully opaque due to its thickness and material used, it will pose some challenges during measurement. Multiple folds of the same glove is recommended to ensure opacity before presenting it for color measurement. For highly translucent gloves, a trans-reflectance measurement, using a white ceramic tile as backing, is preferred.

Opacity of disposable gloves can also be determined by using color measurement instrument with a technique called contrast ratio. The luminous reflectance of glove sample backed by a black substrate (e.g., black ceramic tile) divided by the luminous reflectance of the same sample backed by a white substrate (e.g. white ceramic tile) is taken as an index of opacity. If the glove is completely opaque, its opacity is 100. The more transparent the glove, the smaller the opacity index will be.

Konica Minolta offers a wide range of colorimeters and spectrophotometers for gloves color measurement. For more information on color measuring instruments, please visit Konica Minolta website at http://sensing.konicaminolta.asia/applications/color-measurement/

You can visit this website at https://wwws.konicaminolta.net/instruments/registration_index/ to download our education handbook, Precise Color Communication, which describes the basic theory of color and object color measurement. It includes information on the differences between spectrophotometers and tristimulus colorimeters, as well as an overview of the various color spaces and color-difference notations commonly used.