



Spectrophotometers can help you determine how translucent or opaque your contact lens pigmentation is, improving quality. Image Source: Unsplash user Daniil Avilov

Using colored contact lenses, a professional cosplayer is able to completely transform her appearance within seconds. One moment, she's a brunette with rich brown eyes. But after popping on a pair of bright purple contact lenses (with [a wig to match](#)), she suddenly transforms into a cartoonish alien character that barely resembles herself.

Since the invention of cosmetic colored contact lenses in 1969, cosplayers, makeup artists, Halloween trick-or-treaters, and everyday contact lens users have used colored contacts to alter their original eye color.⁴ However, in order to completely cover someone's natural eye color, these contact lenses need to have enough pigment to hide the iris' original hue. This can be a complicated and difficult process for manufacturers; if they don't inject enough pigment into the lens, the final effect will look muddy while injecting too much may look unnatural. Even if you're making semi-translucent lenses that are only meant to enhance the wearer's natural eye color, pigment accuracy is still vital. You have to ensure that the colors look subtle, appealing, and completely natural. [Analyzing your lenses](#) using spectrophotometric instrumentation helps you achieve the perfect pigment balance to ensure your customers can create their ideal look.



Unusual patterns are almost always made using fully-opaque contact lens dyes. Image Source: Wikimedia user Anime Evolution

Lens Pigmentation Can Be Hard to See Using the Naked Eye

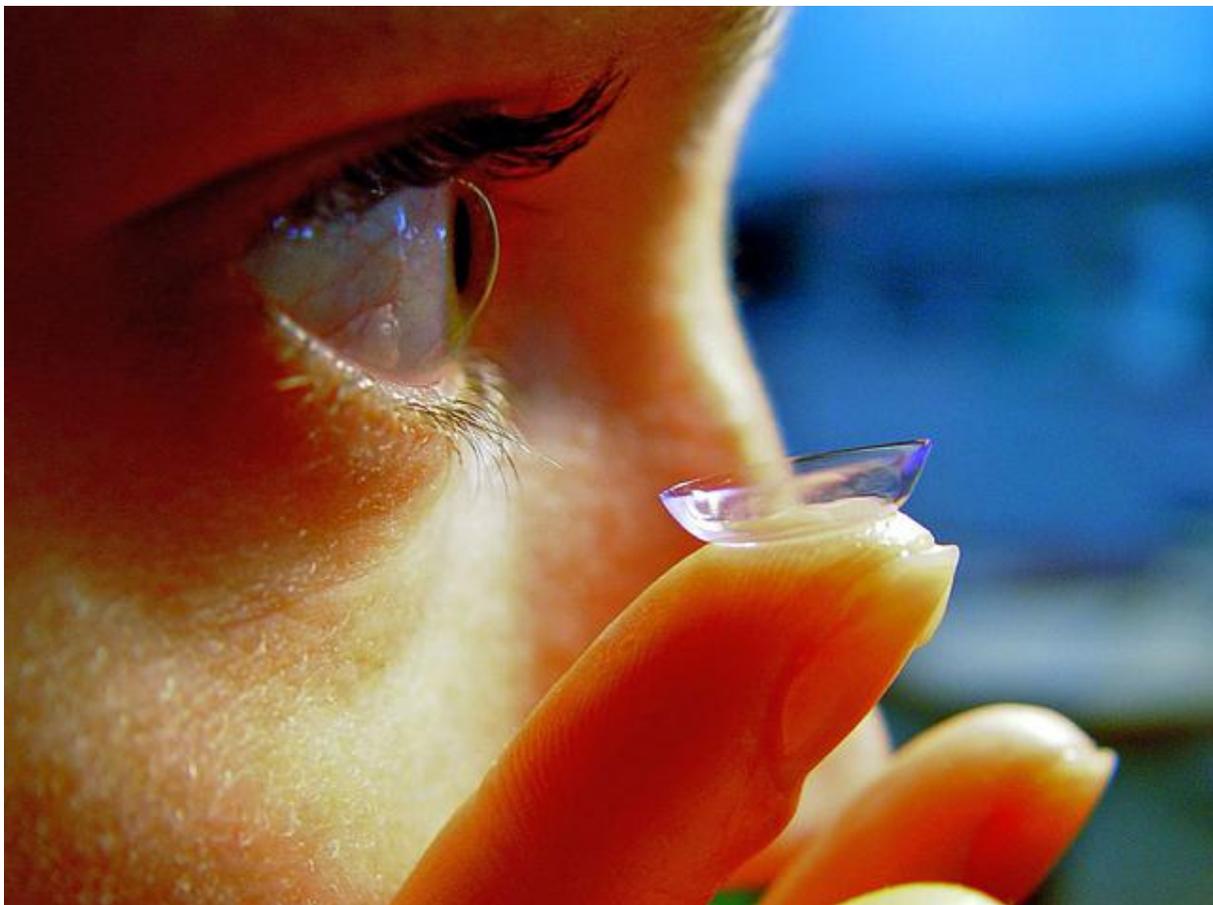
There are three types of colored contact lenses currently available on the market: visibility tint, enhancement tint, and opaque tint.² Visibility tint is very subtle, and it's designed to retain the eye's original color while it's worn. These [aren't cosmetic lenses](#)—they are only lightly colored so that wearers can see the contact lens more easily during removal and insertion. Meanwhile, cosmetic lens manufacturers use a stronger enhancement tint or opaque tint to make their products, depending on the desired effect. Enhancement tint amps up the natural colors of the eye; if you have green eyes, a green enhancement lens will make them appear even more vividly emerald. These lenses have a slightly translucent look. By comparison, opaque tinted contacts are far more dense with pigment, and you often can't see through the colored portions of the lens at all. These are designed for true eye color transformation—with these, your eyes can change from hazel brown to sky blue instantly.

It can be difficult to [judge the true color](#) of these three tints using your naked eye alone. Visibility and enhancement tints are so subtle that they may initially appear too light on the lens when inspected by a human viewer. If you overcorrect for this, you could produce an [unnatural-looking lens](#) that your customers won't find appealing. An opaque lens is slightly easier to judge based on appearance since the colors are more vibrant, but even then it's hard to know whether there's true color penetration or if there are some patchy spots in the lens where the color didn't come through. This is why you need spectrophotometric instrumentation to help you determine whether your lenses are correctly colored.

Spectrophotometers Help You Create the Right Hue

Although some customers prefer their lenses to have a more natural look, others like to experiment with unusual patterns or colors that you would never find in nature. The problem with creating these types of lenses from scratch is that it's very difficult to know how the lens will appear once it's being worn by the customer.³ It may look opaque on the surface, but when it's inserted, the colors may not appear as vibrant as you thought. Or, you may create the perfect colored contact lens, but when you try to repeat the process during mass production, there may be too much variability in color and quality.

To fix this problem, you should use a spectrophotometer as part of your quality control process, especially when you pick out your original dye. These instruments are useful for determining how saturated the tint will be before you inject it into the lens and whether the color is locked into place properly shortly after injection. Spectrophotometers can detect even slight changes in hue between two different dye samples. Using this method, you can ensure that every colored contact you release is perfectly colored and allows your customers to achieve their desired effect. After all, a pink-eyed demon costume isn't nearly as fearsome as a red-eyed one. Just a small difference in hue can completely change the costume's effect.



Customers expect to receive contact lenses that are true to color; variations in color are a sign of low quality and can ruin a costume look. Image Source: Wikimedia user איתן טל

Loss of Pigment Happens During Disinfection

To make any type of colored contact lens, manufacturers usually diffuse an eye-safe colored dye into the hydrogel that forms the shape of the lens. On one side of the lens, the dye penetrates directly into the hydrogel for the most opaque results. On the other side, the manufacturer adds a layer of precipitant. By doing this, the two sides meet in the middle of the lens, but the dye stops before it

can fully penetrate the precipitant side. From here, another layer of hydrogel or polymer is added on top of the dye side, sandwiching the color in the center. This gives the lens its rich color without risking contact between the eye and the dye. However, this process doesn't always go according to plan, especially when you disinfect the lenses before you ship them off to customers.

The chemicals used during disinfection often cause a slight loss in color opacity, especially if there isn't enough dye penetration in the hydrogel. Using [a spectrophotometer](#), you can evaluate the impact of your disinfection processes on the color of your product. To do this, test your lenses before they go through disinfection, and then compare that measurement to the post-disinfection color measurement. If you properly trapped your dye between the layers of hydrogel, then you'll see little, if any, change in color. But if you didn't seal the dye properly, you will see a major difference in hue, compromising the appeal of the lens.

HunterLab Reliability

Whether you're creating natural-looking, subtle contact lenses for people who want to make their eyes stand out, or you're crafting custom costume designs unlike anything your customers have ever seen, we can help you find all of the tools that you need. Our dedication to color quality control makes us one of the best resources in the world for industries that require a great deal of precision, like contact lens manufacturers. [Contact us](#) today to find out more about how our spectrophotometers can improve your products.

1. "History of Colored Contact Lenses", https://www.contactlenses.co.uk/education/EHC_Left_menu/contact_lenses/history_of_coloured_contact_lenses.htm
2. "Color Contact Lenses", October 26, 2017, <http://www.allaboutvision.com/contacts/colors.htm>
3. "Colored Contact Lenses for Brown Eyes", <https://eyecandys.com/pages/colored-contacts-for-brown-eyes>