Technical Tip

Lens Tinting

Pre/post Lens Treatments:

- Lens preparation is best using clean warm water with a few drops of mild dish soap. Isopropyl alcohol, when needed, may also be used. Do not use acetone or MEK to clean polycarbonate lenses.
  - Prior to tinting, assure all markings have been entirely removed.

Dye quality:

- Manufacturers of dye, lenses, and varieties of lens materials and coatings all contribute to alteration of the final lens color and transmission, so some experimentation is recommended for desired results.
- Most dyes marketed today produce an excellent end-product. It is important to maintain a fresh dye mixture, as extended use will deplete vital pigments for obtaining the desired hue balance.

Tinting unit:

- Dye heating units directly affect tint quality:
  - Ideal units will be capable of closely controlling the temperature within a few degrees.
  - Agitation of the dye mixture adds to efficiency of unit operation.

Water:

- Tap water is typically best for initial mixing; electrolytes in tap water actually enhance the tinting process. Tap water yields the best results after allowing settling a few hours, which allows suspended sediments to settle.
- Purified water is excellent for replenishment of evaporation. Beyond the needed electrolytes, most purified water will create an acidic solution, where slightly alkaline water produces faster and darker tints.
- In the past, uncoated monomers such as CR39 worked well with DI, distilled, or reverse osmosis treated water, but the introductions of scratch coatings have changed industry practices.

Mixing procedures:

- **Clean:** When mixing fresh dyes, it is important to begin with a clean tank and rinse the dye container completely. Remove any settled dye – this affects final hues.
- **Temperature:** Dyes should be mixed with warm water. Dye mixtures should be brought up to working temperatures for one hour prior to actual use, assuring activation of all pigments.
- **pH Balance:** If pH measurement is monitored, 8.1 to 8.9 pH is recommended for most scratch-coated products.

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Lens Tinting (Continued)

Temperature:

- Required hue and transmission is directly dependent upon working temperatures. Ideal temperatures for most dyes will be at 205°F:
  - Typical black dyes will exhibit red hues at 201°F and blue hues at 208°F.
  - Primary colors such as blue, red, and yellow do not require temperatures quite as hot for color balance.
- Do not heat neutralizers beyond 195°F, as they can damage coatings and some substrates:
  - Rather than rely on unit settings, measure each container. Variances of up to 20°F have been observed.

Tinting Length of Time:

- Sunglass Shade: dark tints typically can be reached within 20 minutes.
- Cosmetic tints can be reached within seconds to a few minutes.
- Be aware that some coatings will not absorb dye, or may absorb minimal amounts of dye. Additionally, most absorption is on the back surface of the lens. If a lens is backside coated, dye absorption will be affected and dependent on the coating.
- In any case, recommended maximum tinting times of 30 minutes should not be exceeded. Remember that gradient tints also create possible damaging heat and extreme humidity upon the portion of lens above the dye, whether or not the lens is in the dye.

Technique:

- Due to the nature of polycarbonate, suspended gasses within the dye will adhere to the lens, creating "white spots". Agitation of the lenses every 3 to 5 minutes while in the dye will dislodge most bubbles. If a clear spot does appear, re-dying the lens for 5 minutes will usually help alleviate the spots.
- Experience will indicate best methods.

Neutralizing:

- Most commercial neutralizers have been found to attack the polycarbonate substrate, eventually damaging the coating.
- The most efficient neutralizing agent tested is a 10% to 30% mild dish soap and water solution at a temperature of 190°F. You can expect to remove as much as 70% to 90% of the unwanted dye.
- This method also works with other ophthalmic materials.

Technical Tip

Lens Tinting (Continued)

Tinting Prior to Anti-Reflective Coatings:

- The cleaning process in anti-reflective coatings often removes some dye, causing a slight bleaching of tint and sometimes hue alteration.
- In a pair of lenses dyed to a dark tint that required one lens to be hue modified (such as a little extra blue dye), it is common for those lenses to be returned unmatched. Tinting slightly darker than needed, followed by a quick exposure to neutralizer will typically assure the desired final results.

Manufacturer/material varieties:

- Lens materials and various coatings provide different tinting results. Due to variations in manufacturing, even prescription power can differentiate final hues and intensities.
- Where possible, it is best to develop different dye mixtures for the various materials to achieve correct color sample match.

Coating varieties:

- Not all coatings are tintable. Some coatings are specially formulated for increased scratch resistance, which typically eliminates dye absorbency, although some dye may enter the coating.
- Do not attempt tinting lenses if not recommended by the manufacturer.

U.V. treatments:

- The nature of polycarbonate requires no further ultraviolet filtering. Do not attempt to apply U.V. dyes to polycarbonate as structural damage may occur.

For any additional technical questions, call the toll-free Technical Services Hotline: (877) 528-9576
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