



2429 Oakwood Blvd Melvindale, MI 48122 Phone 800.537.2831 Fax 800.638.8577

Chemical Tempering

Chemtempering strengthens glass lenses by putting the surface of the glass into compression. The process by which this occurs is the exchange of ions. During the chemtempering process lenses are submersed in a bath of molten salt as a prescribed temperature. The heat causes the smaller ions to leave the surface of the glass and the larger ions present in the molten salt to enter it. Once the lenses are removed from the bath and cooled, they shrink. The larger ions that are now present in the surface of the lens are crowded together. This creates a compressed surface, which results in a stronger lens that is more resistant to breaking.

Chemtempering creates a uniform layer of stress. This is because the ion exchange occurs uniformly on all surfaces. Unlike the air tempering process, chemtempering has no relationship to lens thickness. This difference is evident when lenses tempered in thee two ways are viewed in crossed polarized light. The air tempered lenses typically display various stress patterns; one of the most common resembles a maltese cross. In the uniformly tempered lenses, such patterns do not exist. Drop ball tests support the superior impact strength of chemtempering.

GLASS TYPE	BATH COMPOSITION	TIME	TEMPERATURE
White Crown & Fixed Tints	100% KNO ₃	16 ± 2 hours	450° ± 5°C
Photochromic	60% KNO ₃ 40% NaNO ₃	16 ± 2 hours	400° ± 5°C
Photochromic	100% KNO ₃	Minimum 2 hours Maximum 4 hours	450° ± 5°C

*Never mix Photochromic and fixed tint glass in the same chemical bath.
Fixed tint glass includes: Green 1, 2, 3; Gray 1, 2, 3; Rose 1, 2, 3; Rose Didymium; Tan 1, 2, 3; Canary Yellow; Yellow Crown*

GLASS LENSES WHICH CANNOT BE TEMPERED: 1.80 LEADED X-RAY, KG-3 INFRARED FILTER, ALL LAMINATED LENSES INCLUDING POLAROIZED.

Preheat, Post-Cool, General Precautions

An important 15 minutes: preheat and post cool lenses.

Photochromic Lenses

- Preheat: Photochromic lenses should be allowed to preheat over the chemical bath for 15 minutes before immersing them in it.
- Post cool: After photochromic lenses are chemtempered, suspend them over the chemical bath for post cooling. The post cooling time should never exceed 15 minutes. Remove photochromic lenses from their suspended position over the bath as quickly as possible in order to preserve the photochromic properties

White Crown and Fixed Tints:

- Preheat: Crown lenses should be allowed to preheat over the chemical bath for at least 15 minutes before immersing them in it. If breakage occurs, preheat 30 to 60 minutes.
- Post cool: After crown lenses are chemtempered, suspend them over the chemical bath for at least 15 minutes. This will allow them to cool. If breakage occurs, post cool for 30 to 60 minutes.



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GENERAL PROCESSING PRECAUTIONS

- Before processing, make sure lenses are clean and dry
- After lenses have been processed in the salt bath and cooled, rinse salt away in warm to hot water. Do not use cold water as it may cause thermo shock, and result in breakage. Then dry lenses thoroughly. Allowing them to drip dry may cause spotting
- If lenses are to be coated, the coating application must be done after they are chemically strengthened. Coated lenses must be drop ball tested after the coating is applied.

PROBLEM	PROBABLE CAUSE	SUGGEST CORRECTION
Hazy surface	<ul style="list-style-type: none"> • New bath-not cured for long enough before use 	<ul style="list-style-type: none"> • Polish lenses to remove haziness • Allow bath to cure for at least 24 hours <p>Place no lenses or dummy lenses in bath during this time</p>
Hairline surface cracks seen after chemtempering	<ul style="list-style-type: none"> • Salt contaminated and/or ph to high • Bath temperature too hot • White Crown or fixed tint lenses in photochromic bath 	<ul style="list-style-type: none"> • Replace salt • Check bath temperature with accurate thermometer and correct temperature • Discard lenses and redo in proper bath
Excessive breakage during drop ball test	<ul style="list-style-type: none"> • Edging flaws • Insufficient grinding and/or polishing on concave side of lens • Bath temperature too hot or too cold 	<ul style="list-style-type: none"> • Check edging wheel and rettrue or replace • Check generator wheel and rettrue or replace • Increase fine grind time • Check bath temperature with accurate thermometer and correct temperature
Pitted lenses	<ul style="list-style-type: none"> • Bath temperature too hot 	<ul style="list-style-type: none"> • Check bath temperature with accurate thermometer and correct temperature
Spotted lenses	<ul style="list-style-type: none"> • Lenses not thoroughly cleaned before tempering • Lenses were allowed to drip dry, resulting in spotting before they were chemtempered, tempering enhances spots 	<ul style="list-style-type: none"> • Make sure lenses are thoroughly cleaned before tempering • Make sure lenses are thoroughly cleaned • Do not allow lenses to drip dry
Tan C, hazy or etched upper segments	<ul style="list-style-type: none"> • Salt contaminated and/or PH to high 	<ul style="list-style-type: none"> • Replace salt

This information was taken from the technical book from X-Cel