

Our Lead-free Type Glass Color Series

May, 2009

Characteristics of LN Series

1. Lead-free zinc type glass color (Bismuth type having better gloss than zinc type is also available.)
2. Applicable to glassware decoration such as cosmetic bottle.
3. Color matching of red, yellow, white, black, brown, green, blue and others is applicable {in case of bismuth type, except cadmium containing colors (Red and Yellow)}.

Characteristics of LES Series

1. Lead-free bismuth type glass color.
2. Acid resistance is good and mainly used to returnable bottle.
3. Color matching is possible except cadmium containing colors (Red and Yellow).

Characteristics of LEV Series

1. Lead-free and Bismuth-free Zinc type glass color.
2. Applicable to returnable bottle and glass for home appliances.
3. Chemical resistance is good.
4. Color matching of red, yellow, white, black, brown, green, blue and others is applicable.

Characteristics of LEZ Series

1. Lead-free and Bismuth-free zinc type glass color.
2. Applicable to mainly glass for home appliances (oven range, others).
3. Color matching of red, yellow, white, black, brown, green, blue and others is applicable.

Characteristics Table of LEEEX Series

1. Lead-free zinc type glass color.
2. Applicable to architectural and industrial glasses. → Have the lowest thermal expansion index among our glass colors.
3. Color matching of red, yellow, white, black, brown, green, blue and others is applicable.

OKUNO CHEMICAL INDUSTRIES CO., LTD.

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Lead-free Glass Color : Characteristics Table of LN Series

	LN Series	LN Series
Composition of Glass	Zinc Type Glass	Bismuth Type Glass
Firing Temperature(°C)	590~620	590~620
Alkali Resistance ^[※1]	2	2
Acid Resistance ^[※1]	2	2
Gloss ^[※2]	3	4
Red-Yellow Pigments (Contain Cadmium)	○	×

※1:Resistance...(very high) 5 ⇄ 4 ⇄ 3 ⇄ 2 ⇄ 1 (very low)

※2:Gloss...(very high) 5 ⇄ 4 ⇄ 3 ⇄ 2 ⇄ 1 (no gloss)

(This is the evaluation result by our own standard.)

Lead-free Glass Color : Characteristics Table of LES Series, LEV Series and LEZ Series

	LES Series	LEV Series	LEZ Series
Composition of Glass	Bismuth Type Glass	Zinc Type Glass	Zinc Type Glass
Firing Temperature(°C)	610~630	620~660	650~670
Alkali Resistance ^[※1]	3	3	3
Acid Resistance ^[※1]	4	4	3
Gloss ^[※2]	4	3~4	3
Red-Yellow Pigments (Contain Cadmium)	×	○	○

※1:Resistance...(very high) 5 ⇄ 4 ⇄ 3 ⇄ 2 ⇄ 1 (very low)

※2:Gloss...(very high) 5 ⇄ 4 ⇄ 3 ⇄ 2 ⇄ 1 (no gloss)

(This is the evaluation result by our own standard.)

Lead-free Glass Color : Characteristics Table of LEE Series

	LEE Series
Composition of Glass	Zinc Type Glass
Firing Temperature(°C)	650~680
Alkali Resistance ^[※1]	2
Acid Resistance ^[※1]	2
Gloss ^[※2]	2~3
Red-Yellow Pigments (Contain Cadmium)	○

※1:Resistance...(very high) 5 ⇄ 4 ⇄ 3 ⇄ 2 ⇄ 1 (very low)

※2:Gloss...(very high) 5 ⇄ 4 ⇄ 3 ⇄ 2 ⇄ 1 (no gloss)

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Our Lead-free Type Glass Color Series

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Characteristics of LEG Series

1. Lead-free phosphate type glass color.
2. Applicable to glassware decoration such as fancy bottle, disposable bottle and others.
3. Color matching of red, yellow, white, black, brown, green, blue and others is applicable.

Lead-free Glass Color : Characteristics Table of LEG Series

	LEG Series
Composition of Glass	Zinc Type Glass
Firing Temperature(°C)	550~620
Alkali Resistance ^[※1]	1
Acid Resistance ^[※1]	1
Gloss ^[※2]	5
Red-Yellow Pigments (Contain Cadmium)	○

※1:Resistance... (very high) 5 ⇔ 4 ⇔ 3 ⇔ 2 ⇔ 1 (very low)

※2:Gloss... (very high) 5 ⇔ 4 ⇔ 3 ⇔ 2 ⇔ 1 (no gloss)

(This is the evaluation result by our own standard.)

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