TECHNICAL APPLICATION BULLETIN

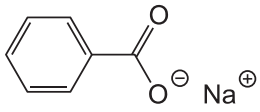
Kalama® and Purox®

Benzoate Preservatives & Antimicrobials for Personal Care

A Safer Alternative for Personal Care and Cosmetics Applications

Kalama® and Purox® benzoates are safe, effective solutions to preserve freshness and maintain the integrity of personal care formulations—controlling yeasts, molds, and bacteria in formulations up to pH 6.5—while also meeting consumer demand for **clean labels without parabens, formaldehyde donors, or sensitizers**. They offer an **optimal balance of preservative efficacy, economy, and a consumer-friendly profile.** In addition, they are easy to use (quick solubilizing, low agglomeration) and are **virtually odorless and colorless.**

Purox® S and Kalama® Sodium Benzoates



Typically used at 0.1–1.0% (rinse-off) or 0.1–0.5% (leave-on), alone or with other antimicrobials. Little impact on viscosity. Use salt stable thickener.

Form: white grains, dust-free

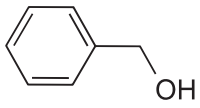
Purity: 99.98% min. (Purox), 99% min. (Kalama)

pH: effective alone up to 6.5*

% Solubility at 25°C:

- Water — 38.0
- Propylene Glycol — 15.0
- Glycerin — >2.0
- Mineral Oil — very low
- Isopropyl Myristate — 0.2
- Cyclopentasiloxane — negligible
- Polydimethyl Siloxane — negligible

Kalama® Benzyl Alcohol



Typically used at 0.3–0.5% with other antimicrobials. Slight viscosity impact.

Form: colorless liquid

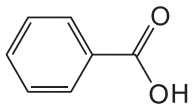
Purity: 99.0% min.

pH: effective up to 8.0

% Solubility at 25°C:

- Water — 4.0
- Propylene Glycol — 100.0
- Glycerin — 100.0
- Mineral Oil — 1.4 – 1.6
- Isopropyl Myristate — >2.0
- Cyclopentasiloxane — >2.0
- Polydimethyl Siloxane — 0.5

Purox® B Benzoic Acid



Typically used at 0.3–0.5%, alone or with other antimicrobials. Little impact on viscosity.

Form: white flakes ("chips")

Purity: 99.98% min.

pH: effective alone up to 5.5*

% Solubility at 25°C:

- Water — ~1.7 (pH 4.5), ~0.5 (3.5), <0.08 (2.5)
- Propylene Glycol — 15.6
- Glycerin — >0.85
- Mineral Oil — very low
- Isopropyl Myristate — 6.0
- Cyclopentasiloxane — 0.3
- Polydimethyl Siloxane — 0.1

* Can be combined with other antimicrobials and multifunctionals to increase pH range of effectiveness

Emerald Performance Materials®
Kalama Chemical

Personal Care Applications

		Face/Neck/Body Care/Sun	Shampoo	Conditioner	Shower/Bath & Liq Soaps	Antiperspirant / Deodorant	Women's Fragrances	Wet Wipes	Oral Care	Feminine Hygiene	Cold/Cough/Pain	Topical Ointments/Lotions
		Applications										
Benzoic Acid	**Purox® B Food/Pharma** FCC, USP/NF, EP, JP	○	○					○	○	○	○	○
Sodium Benzoate	**Purox® S Grains** FCC, USP/NF, EP, BP, JP	●	●	●	●	●		●	●	●	●	●
Sodium Benzoate	**Kalama® Sodium Benzoate** FCC, NF, EP	●	●	●	●	●		●	●	●	●	●
Benzyl Alcohol	**Kalama® Benzyl Alcohol** FCC, NF, EP, BP	●	○	●	○	○	●	○	●			

● Typical Use ○ Effective

Surfactant Compatibility

Purox® and Kalama® benzoate preservatives demonstrate compatibility **in both anionic and cationic systems**. If formulators experience stability issues with sodium benzoate in cationic surfactant systems, it is recommended that the dosage level should be limited to 0.25%.

In some cases, **preservation efficacy can be enhanced through surfactant selection**. Certain anionic surfactants have demonstrated impact on benzoate pK_a, which boosts the antimicrobial performance of Purox® S Sodium Benzoate and Kalama® Sodium Benzoate. Contact Emerald for more information.

Color Stability

Purox® and Kalama® benzoates are **virtually colorless and resist yellowing**. They have minimal impact on color stability in formulations.

Boosters

Purox® and Kalama® benzoates can be used **in combination with multifunctionals and boosters to enhance preservation efficacy and formulation robustness**. Recommended starting levels of common boosters are shown below (based on skin lotion formulation). Contact Emerald for additional formulation guidance.

To further enhance the antimicrobial properties of our products, we recommend adding:

- **Kalama® 3PP Multifunctional:** 0.2% at pH 5.5 / 0.5% at pH 6.5
- **Caprylyl Glycol:** up to 0.50%
- **Chelators:** up to 0.25% of chelators such as EDTA, GLDA, or sodium gluconate

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Preservation Efficacy

The antimicrobial efficacy of Purox® and Kalama® benzoates were evaluated in three model formulations on the following page.

Body Wash, pH 6.5

0.5% Purox® S Sodium Benzoate

0.5% Kalama® 3PP Multifunctional

Wet Wipe, pH 5.5

0.5% Purox® S Sodium Benzoate

Skin Lotion, pH 6.0

0.5% Purox® S Sodium Benzoate

0.5% Kalama® 3PP Multifunctional

Key Takeaways

- Benzoates are **nature-identical preservatives** that help formulators to avoid **parabens, sensitizers, and formaldehyde donors** and listed for use in cosmetic products for formulators seeking **green product certifications**, such as COSMOS and Ecolabel.
- In **formulations up to pH 5.5**, sodium benzoate — a highly water soluble material — is a **very effective and robust antimicrobial**.
- Sodium benzoate efficacy is **enhanced through synergies with multifunctionals and boosters**, providing preservation of a wide range of personal care products **up to a pH of 6.5**.

Toning Wet Wipes (pH 5.5)

Ingredient	Function	Wt (%)
Water	Carrier	92.15
Glycerin	Humectant	3.00
Sodium Lauroyl Methyl Isethionate	Surfactant	2.80
Cocoamidopropyl Betaine	Surfactant	1.55
Purox® S or Kalama® Sodium Benzoate	Preservative	0.50

Substrate: Medline Nature Soft Flushable Dry Wipes (C-fold,100 4.5" x 6.5", cellulose/wood pulp composition, 3:1 ratio of liquid to substrate)

Basic Body Wash (pH 6.5)

Ingredient	Function	Wt (%)
Phase A		
Water	Carrier	78.90
Lauryl / Myristyl Glucoside	Surfactant	4.00
Sodium Laureth Sulfate (2 EO)	Surfactant	12.00
Sodium Coco Fatty Alcohol Sulfate	Surfactant	3.10
Phase B		
Purox® S or Kalama® Sodium Benzoate	Preservative	1.00
Sodium Chloride	Thickener	1.00
Kalama® 3PP	Multifunctional	0.50
Citric Acid	pH Adjuster	to pH 6.5

Skin Lotion (pH 6.0)

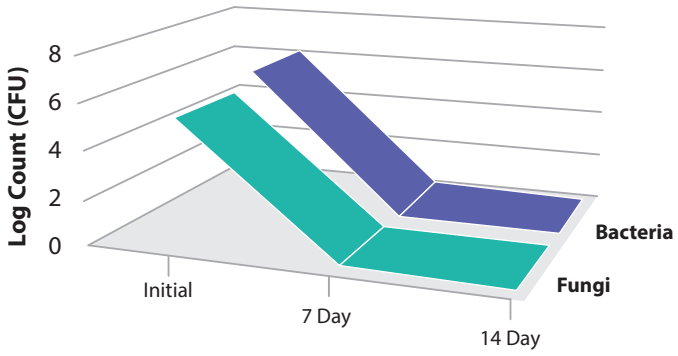
Ingredient	Function	Wt (%)
Phase A		
Water	Carrier	79.90
Glycerin	Humectant	5.00
Xanthan Gum	Rheology Modifier	0.10
Phase B		
Cetearyl Alcohol	Rheology Modifier	3.00
Steareth-21	Emulsifier	2.00
Steareth-2	Emulsifier	2.00
Paraffinum Liquidum	Emollient	5.00
Petrolatum	Emollient	2.00
Phase C		
Purox® S or Kalama® Sodium Benzoate	Preservative	0.50
Kalama® 3PP	Multifunctional	0.50

Preservation Efficacy

Preservation Efficacy: Toning Wet Wipes

Method: Modified PCPC M5 Method (accelerated); double inoculation.

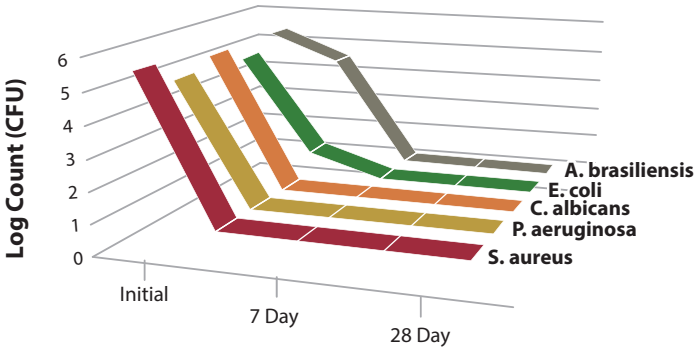
Organisms: P. aeruginosa, B. cepacia, E. coli, S. aureus (bacteria); A. brasiliensis, C. albicans, P. pinophilium (fungi)



Preservation Efficacy: Basic Body Wash

Method: European Pharmacopeia / US Pharmacopeia; single inoculation

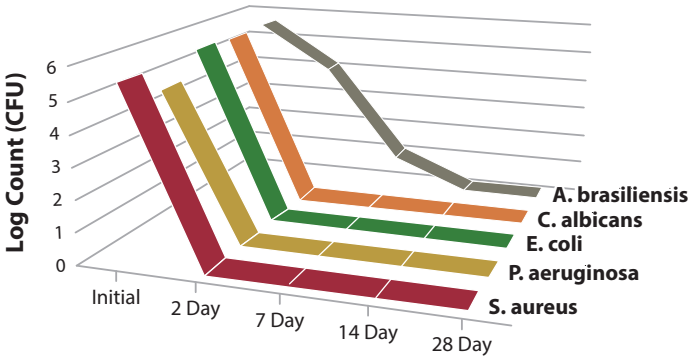
Organisms: S. aureus, P. aeruginosa, E. coli (bacteria); C. albicans, A. brasiliensis (fungi)



Preservation Efficacy: Skin Lotion

Method: European Pharmacopeia / US Pharmacopeia; single inoculation

Organisms: S. aureus, P. aeruginosa, E. coli (bacteria); C. albicans, A. brasiliensis (fungi)



Regulatory

Safe Use Levels for Personal Care Products*

	Benzoic Acid	Sodium Benzoate	Benzyl Alcohol
Rinse Off	2.5%	2.9%	1.0%
Oral Care	1.7%	2.0%	1.0%
Leave On	0.5%	0.59%	1.0%

* Annex V 1223/2009 (EU)

Global Inventories

- Australia (AICS)
- Canada (DSL)
- China (IECSC)
- Europe (EINECS)
- Europe (REACH)
- Japan (ENCS)
- Korea (KECL)
- New Zealand (NZIoC)
- Philippines (PICCS)
- Taiwan
- United States (TSCA)

Additional Compliance Information †

Regulation	Guidelines	Results
REACH	OECD Guideline 404 (Acute Dermal Irritation / Corrosion)	Not irritating (Daamen P. A. M. [**1989a**])
Cosmetics Testing	EC Regulation 1223/2009	In compliance

† European Union Regulation (EC) No 1223/2009 regarding animal testing "On cosmetic products" – in compliance. Emerald does not perform animal testing of our materials for their use in cosmetic products. In instances where animal testing is required for another regulation, such as REACH, every effort is made to ensure that protocols and procedures are consistent with existing, accepted guidelines, and meet all relevant animal welfare regulations.

These products are not authorized for use in applications governed by BPR. For more information about household care applications, please contact Emerald at kalaguard@emeraldmaterials.com.

Emerald Kalama Chemical is a leading global supplier of benzoic acid, benzaldehyde, and related downstream specialties, with world-scale, backward integrated facilities in Kalama, Washington (USA) and Rotterdam, Netherlands.

Products include benzoate preservatives, intermediates, high purity flavor and fragrance ingredients, plasticizers, coalescents, antioxidants, and accelerators. With manufacturing in the United States and Europe and a global sales and distribution network, we serve customers globally.

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