

Phenylethyl Resorcinol

Alkylresorcinols are amphiphilic phenolic lipids widely found in natural plant and grain extracts. Phenylethyl resorcinol is a structurally optimized alkylresorcinol derivative with over 20 years of applied research in brightening skincare and functional ingredient fields. Relying on its stable tyrosinase inhibitory activity, it has become a commonly used choice among mainstream mid-range skin-brightening ingredients on the market.

Phenylethyl resorcinol possesses good formulation compatibility and use safety. Safety and toxicological tests in various countries have verified no teratogenic or mutagenic risks. It is listed in multiple national regulatory catalogues including China's Catalogue of Used Cosmetic Ingredients (2021 Edition) and the EU cosmetic ingredient inventory, and is a compliant and commonly used brightening and even-toning active ingredient in the cosmetics field. Early products were limited by purification processes and raw material costs, often accompanied by trace irritating by-products. With the iteration of refined synthesis processes, high-purity grade products have gradually entered mass production, impurity levels are continuously controlled, and skin tolerability has steadily improved. A conventional cosmetic addition range of 0.2%–0.5% delivers practical brightening effects, and can be used to improve skin concerns such as dull tone, superficial post-sun hyperpigmentation, and mild post-acne hyperpigmentation, suitable for daily basic brightening skincare products. In vitro enzyme activity data show that phenylethyl resorcinol competitively binds to the tyrosinase active site to inhibit melanogenesis, with inhibitory efficacy superior to kojic acid and arbutin, but weaker than 4-butylresorcinol and hexylresorcinol. Extensive formulation and clinical studies confirm that the combination of phenylethyl resorcinol with niacinamide, tranexamic acid, vitamin C derivatives, and licorice extract produces synergistic brightening effects, with multi-dimensional additive actions across melanin synthesis, melanin transport, and antioxidant defense, optimizing overall product efficacy in brightening skin tone, soothing skin, and preventing post-sun darkening, making it a highly versatile classic active in compound brightening formulations.

Product Information

Product Name	377
INCI Name	PHENYLETHYL RESORCINOL
CAS No.	85-27-8
EC No.	480-070-0
Appearance	White powder
Purity	≥99%
Solubility	Chloroform (slightly soluble), ethyl acetate (slightly soluble)
Recommended Use Level and Formulation pH	Leave-on skincare use level: 0.3%–1%; optimal formulation pH: < 6
Storage	Store in original sealed container at 10–30°C; protect from light, heat, and moisture.
Regulatory Status	Globally recognized

Human Skin Tolerability

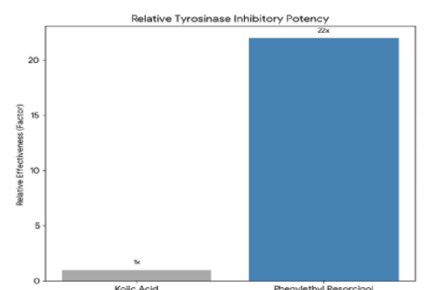
Safety assessment based on MOS values: Compared with 1% kojic acid (MOS=88), 1% phenylethyl resorcinol was found to be safe for topical application (MOS=356). MOS values of 100 and above are considered safe. MOS was calculated for facial products at a 1% usage level.

Human Repeat Insult Patch Test (HRIPT) for evaluating allergy/skin irritation/skin sensitization: (0.5%, 1%, 2% in corn oil); phenylethyl resorcinol was found to be a non-primary irritant and non-primary sensitizer.

Chamber scratch test for evaluating skin irritation propensity: (0.1% and 0.5% in petrolatum) on scratched skin; phenylethyl resorcinol was found to have low irritation potential, with no significant abnormal irritation reaction compared with the saline control.

In Vitro Enzyme Inhibitory Activity

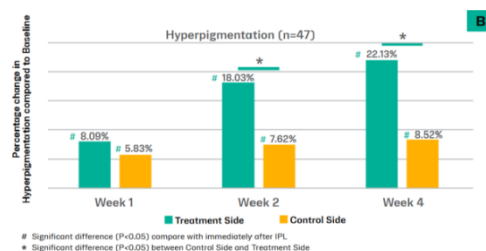
- **Enzyme** — In vitro tyrosinase
- **Substrate** — L-DOPA
- **Test substances**—Phenylethyl resorcinol, kojic acid (PER/377)
- **Measurement** — Spectrophotometry; spectral range 490 nm
- **Performance quantification**—Half maximal inhibitory concentration (IC₅₀), i.e., the sample concentration required to inhibit 50% of enzyme activity



Phenylethyl resorcinol is a potent competitive tyrosinase inhibitor that precisely chelates copper ions in the tyrosinase active center, blocking the rate-limiting reaction of melanogenesis. Quantitative assays show that the tyrosinase inhibitory potency of PER is 22 times that of kojic acid.

In Vitro Melanin Inhibitory Activity

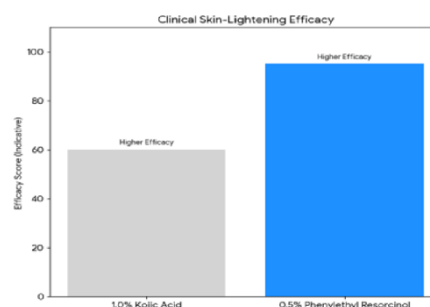
- **Cells** — Mel-A3 immortalized mouse melanocytes
- **Incubation time** — At 37°C, 5% CO₂, continuous incubation with test substance for 4 d (96 h); cell viability assay incubated for 24 h
- **Test substances** — 0.1%–0.5% gradient phenylethyl resorcinol
- **Measurement** — 590 nm
- **Performance quantification** — Half maximal effective concentration (EC₅₀), i.e., the sample concentration required to inhibit 50% of melanin synthesis



Within the 0.1%–0.5% concentration range, the melanin synthesis inhibitory effect significantly increases with dosage. At 0.5% addition, it significantly downregulates TYR and TRP-2 gene expression in melanocytes, reducing melanogenesis at the source. When used in post-IPL (Intense Pulsed Light) skincare with 0.5% phenylethyl resorcinol, the improvement in hyperpigmentation at weeks 1/2/4 was significantly greater than the blank control group receiving IPL only, reaching a 22.13% pigmentation improvement at week 4.

Human Skin Brightening Clinical Trial

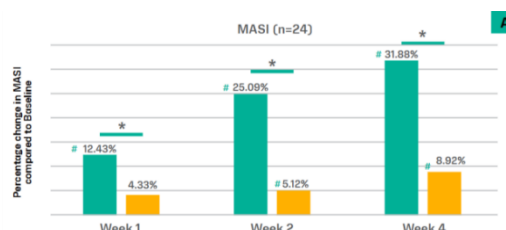
- **Volunteers** — Clinical subject population with pigmentation concerns
- **Study duration** — Multi-week continuous topical intervention, periodic assessment of skin tone improvement
- **Test site** — Full-face dullness, melasma/sunspot areas
- **Test substances** — Control group: 1.0% kojic acid topical preparation; test group: 0.5% phenyl ethyl resorcinol topical preparation
- **Frequency of use** — Standardized application twice daily, morning and evening
- **Performance quantification** — Standardized clinical efficacy score (Indicator score), directly quantifying the comprehensive improvement in skin brightening and pigment fading



A human split-face blinded clinical trial confirmed that a low-concentration 0.5% PER formulation achieved significantly higher comprehensive brightening and spot-fading clinical scores than a high-concentration 1.0% kojic acid formulation. This fully validates that the potent in vitro enzyme-inhibitory activity of PER translates into actual skin spot-fading and brightening effects in humans, rather than being a mere laboratory artifact. Low addition levels achieve stronger even-toning and spot-fading effects while balancing formulation gentleness and skincare efficacy, suitable for long-term daily brightening skincare.

Clinical Study on Hyperpigmentation Control

- **Trial model** — Human split-face randomized blinded clinical trial, subjects including melasma and solar lentigo populations, total sample size n=47
- **Intervention period** — Baseline, week 1, week 2, and week 4 follow-up assessments after IPL photorejuvenation; test serum initiated compliant 1–3 days post-procedure, applied twice daily
- **Test substances** — Serum formulation containing phenylethyl resorcinol (377); control side received basic skincare only
- **Performance quantification** — Percentage decrease in hyperpigmentation index relative to baseline; higher values indicate stronger pigment-fading effect; # indicates $P < 0.05$ within the same group compared with immediate post-procedure; * indicates $P < 0.05$ between treated and control sides at the same time point



After 4 weeks of continuous use, the melasma MASI (Melasma Area and Severity Index) on the treated side decreased by 31.88%, compared with only 8.92% in the control group. The pigmentation improvement effect continues to increase with duration of use; long-term use fades superficial pigmented spots and evens overall skin tone.

Reduction of Skin Hyperpigmentation in Subjects

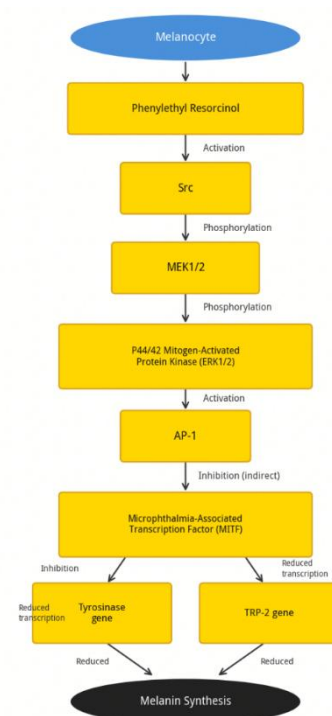
- **Volunteers** — 22 adult subjects with facial melasma
- **Study duration** — 8 weeks, assessed at baseline, week 4, and week 8
- **Test site** — Full-face melasma lesion areas, pre- and post-treatment self-control within the same subject
- **Test substance** — Topical spot-fading preparation containing 0.5% phenylethyl resorcinol
- **Frequency of use** — Applied evenly to pigmented areas twice daily, morning and evening
- **Performance quantification** — Mexameter melanin index measurement, standardized facial imaging archive, dermatologist clinical visual assessment: melasma lesion area, pigmentation depth, contrast between spots and surrounding skin, full-face even brightening degree, MASI (Melasma Area and Severity Index)



After 8 weeks, the spot area, pigment depth, and skin tone contrast on the treated side all significantly improved. Only a few subjects experienced brief mild redness that resolved spontaneously; overall skin tolerability was excellent.

Multiple Pathways Affecting Melanogenesis

- Phenylethyl resorcinol enters melanocytes and activates Src protein
- Src phosphorylates and activates MEK1/2, which in turn phosphorylates p44/42 MAPK (ERK1/2)
- p44/42 MAPK activates AP-1, indirectly inhibiting MITF (the master transcription factor for melanogenesis)
- Following MITF downregulation, transcription of tyrosinase (TYR) and TRP-2 genes is suppressed
- Ultimately, melanin synthesis is substantially reduced



Recommended Synergists/Additives for Enhancing Skin Brightening/Even-Tone Effects

Synergist/Additive	Rationale/Mechanism	Use Level
Tranexamic Acid INCI: TRANEXAMIC ACID	Blocks UV/inflammation-induced melanogenic factors upstream, complementing the enzyme-inhibitory pathway of 377; reduces post-acne hyperpigmentation and mitigates ingredient irritation.	2%
Niacinamide INCI: NIACINAMIDE	Blocks melanosome transfer to keratinocytes. 377 inhibits melanogenesis while niacinamide blocks transfer; the dual combination accelerates brightening and fades established pigmented spots.	3%
Acetylzingerone INCI: ACETYL ZINGERONE	Chelates tyrosinase copper cofactors for synergistic enzyme inhibition; broad-spectrum antioxidant protects against photo-damage, improving suntan and freckles.	1%
Glycyrrhetic Acid / Dipotassium Glycyrrhizate INCI: GLYCYRRHETINIC ACID	Soothes and anti-inflammation, reduces the irritation risk of 377 on thin and sensitive-phase skin, repairs and stabilizes the skin barrier.	0.1~0.3%

A Multifunctional Skin-Brightening Active Ingredient

Safe and Effective Skin Brightening Agent / Even-Tone Active

- Over 20 years of compliant cosmetic application history worldwide; listed in multiple national ingredient catalogues and dermatological topical research literature.
- Low-irritation profile; a compliant alternative to the restricted hydroquinone, without the strong cytotoxicity of hydroquinone, with safety significantly superior to hydroquinone.
- Clinically validated across all skin types; suitable for dull skin, post-acne mark skin, tanned skin, and mild melasma skin.

Skin Antioxidant Repair Benefits

- Scavenges skin ROS oxidative free radicals, reduces UV-induced DNA oxidative damage, and repairs photo-damaged cells.
- Increases endogenous glutathione (GSH) levels in skin, strengthening the intrinsic antioxidant barrier.
- Inhibits cross-linking between free sugars and proteins, reduces AGE glycation product formation, and improves yellowing and dullness caused by glycation.
- Antioxidant activity indirectly downregulates skin pro-inflammatory factors, alleviating persistent inflammation-induced hyperpigmentation.

Adjunctive Anti-Photoaging Benefits

- Inhibits UV-induced oxidative degradation of collagen and elastin, maintaining dermal fiber integrity.
- Multiple human clinical studies confirm that long-term use simultaneously improves multiple signs of photoaging including spots, uneven skin tone, roughness, and dull yellowing.

Key Publications

1. Anonymous. Phenyl Ethyl Resorcinol: Chemistry, Synthesis, Tyrosinase Inhibition and Emerging Therapeutic Applications—A Comprehensive Review[J]. International Journal of Innovative Research in Technology.
2. Anonymous. Clinical Safety and Efficacy of a Novel Topical Phenylethyl Resorcinol Formulation for Intense Pulsed Light Adjunctive Usage for Solar Lentigo and Melasma skin[R]. IMCAS Asia Aesthetic Dermatology Conference, 2025.
3. Kang M, Park S H, Park S J, et al. p44/42 MAPK signaling is a prime target activated by phenylethyl resorcinol in its anti-melanogenic action [J]. Phytomedicine, 2019, 58:152877.
4. Fidha T K F, Hijaz N K M, Basheer R, et al. Phenyl Ethyl Resorcinol: Chemistry, Synthesis, Tyrosinase Inhibition and Emerging Therapeutic Applications—A Comprehensive Review [J]. International Journal of Innovative Research in Technology, 2026, 13 (1):6975-6989.
5. Fu Y Y, Liu X M, Lu L, et al. Clinical Safety and Efficacy of a Novel Topical Phenylethyl Resorcinol Formulation for Intense Pulsed Light Adjunctive Usage for Solar Lentigo and Melasma skin [R]. IMCAS Asia Aesthetic Dermatology Conference, 2025.
6. Cosmetic Ingredient Review. Safety Assessment of Phenylethyl Resorcinol as Used in Cosmetics [R]. CIR Expert Panel, 2024.
7. Xing R, Liu L, Guo Z. Evaluation of the melanogenesis-inhibitory activity of phenylethyl resorcinol in B16 melanocytes [J]. Journal of Daily Cosmetic Science and Technology, 2016, 4(3): 185-193.