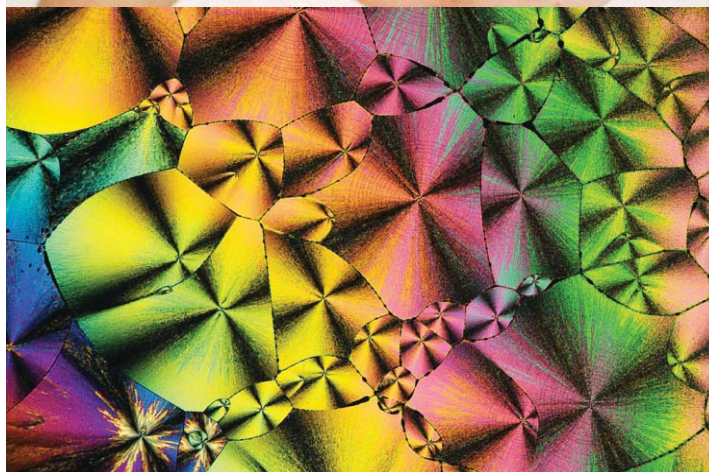


# Niacinamide



Chemical name:	Pyridine-3-carboxamide
CAS No.:	98-92-0
EINECS No.:	202-713-4
INN:	Nicotinamide
INCI:	Niacinamide
Ph.Eur.:	nicotinamidum
IUPAC:	Nicotinamid
CN Code:	2936 2900
Synonyms:	antipellagra-vitamin, vitamin PP (pellagra-preventive), PP-factor, pyridin-3-carboniacidamide, nicotinamide, nicotinic acid amide, sometimes niacin

Producer: JUBILANT ORGANOSYS Ltd., India

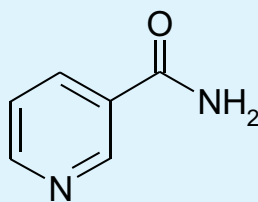


**Kyowa Hakko Europe GmbH**  
Daiichi Fine Chemical Division

## SPECIFICATION\*

Chemical Name: Pyridine-3-carboxamide

Chemical Structure:



Empirical formula:  $C_6H_6N_2O$  Molecular weight: 122.1

Characters: A white, crystalline powder or colourless crystals, freely soluble in water and in ethanol

Identification:

- A: Melting point 128° to 131°C
- B: Examine by infrared absorption spectrophotometry
- C: Boil 0.1 g with 1 ml of dilute sodium hydroxide solution. Ammonia is evolved which is recognisable by its odour.
- D: Dilute 2 ml of solution to 100 ml with water. To 2 ml of solution, add 2 ml of cyanogen bromide solution and 3 ml of a 25 g/l solution of aniline and shake. A yellow colour develops.

Appearance of solution: clear and not more intensely coloured than reference solution

pH-value of solution: pH 6.0 to 7.5

Related substances: thin-layer chromatography (TLC silica gel GF 254 plate): Any spot in the chromatogram obtained with the test solution, apart from the principal spot, is not more intense than the spot in the chromatogram obtained with the reference solution (0,25%).

Heavy metals: Not more than 30 ppm

Loss on drying: Not more than 0.5 %

Sulphated ash: Not more than 0.1 % (free flow quality: NMT 0,7 %)

Assay: 99.0 - 101.0 %  
calculated with reference to the dried substance

\*meets the quality requirements of the current Ph. Eur. Monograph for Nicotinamide

## Other properties

Particle size:

- Fine granular: min. 98% through 20 mesh (ASTM)  
max. 10% through 140 mesh (ASTM)
- Free flow: max. 5% granulation BSS+ #100
- Powder: 100% passing through 60 mesh (ASTM)

Origin: Synthetic

Odour: Almost odourless

## Storage & Packaging

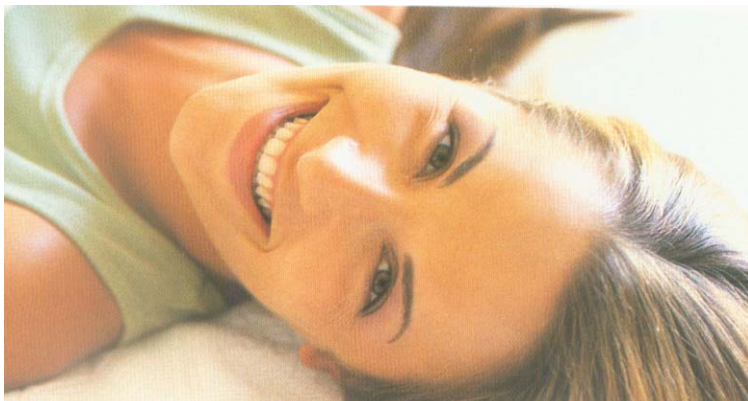
Storage:	Keep closed when not in use. Store in a dry, protected area.
Standard packaging:	20 kg net. carton boxes
Expiry date:	5 years after production date in unopened, original packaging at adequate storage conditions

## Formulating

Stability:	Stable towards oxygen, light, heavy metals, and at a pH range of 3 to 7.5. Do not heat to more than 85°C. In acidic and alkali solutions it is hydrolysed to nicotinic acid
Solubility:	Soluble in water and alcohol. 1 g dissolves in about 1 ml water, 1.5 ml alcohol, 10 ml glycerol. May form crystal salt with acids
Microorganisms:	Total plate count: not more than 1000 CFU/g Mold and yeast: not more than 10 CFU/g E.coli, pseudomonas aeruginosa, staphylococcus aureus absent in 10g
Safety:	Oral LD <sub>50</sub> rat: 3500 mg/kg S.C. LD <sub>50</sub> rat: 1680 mg/kg Oral overdosage of niacinamide is not reported in the literature. In normal doses, nicotinamide is not toxic. Chronic administration at doses of 3 g daily for periods greater than three months may cause nausea, headaches, heartburn, fatigue, sore throat and blurred vision

## General functions

Niacinamide, which is also called nicotinamide, is the physiologically active form of niacin or vitamin B3. It is a member of the B-vitamin family. Another name for this water soluble vitamin is Anti-Pellagra-Vitamin or PP(Pellagra-Preventive)-Factor. Pellagra, Italian for pelle agra meaning rough or burning skin, is a deficiency symptom where the skin becomes extremely rough and skin areas exposed to the sun develop a severe, scaly dermatitis. Niacinamide forms the essential part of the coenzyme nicotinamide adenine dinucleotide (NAD) and nicotinamide adenine dinucleotide phosphate (NADP) that are used to generate energy inside the cells. More than 40 biochemical reactions have been identified and are of paramount importance for normal tissue integrity, particularly for the skin, the gastrointestinal tract and the nervous system.



Another form of vitamin B3 is nicotinic acid. Since both are effective as vitamins the term niacin is often used as group name despite some authors using niacin synonymously only with nicotinic acid.

## APPLICATION IN COSMETICS

taken as summary from article cited below \*

Niacinamide is an active ingredient with an extraordinary breadth of cutaneous benefits. The multiplicity of effects and formulation benefits of niacinamide make it an ideal choice for a variety of cosmetic products targeting young and old skin alike.

### **In-vitro studies:**

Niacinamide coenzymes, the energy "currency" units driving the cell metabolism in the skin are depleted with age. A localized supply of niacinamide or nicotinic acid can help normalize this imbalance.

Aged fibroblasts secrete less collagen than young cells; niacinamide can stimulate new collagen synthesis. Niacinamide has a positive impact on connective tissue and gel matrix components of the skin, which is of particular significance in aged and photoaged skin.

Niacinamide up-regulates epidermal ceramide synthesis with concurrent benefits to the epidermal barrier. Those results were confirmed in in-vivo in studies applying 2% niacinamide.

Niacinamide up-regulates markers of epidermal differentiation, which should have a significant positive impact on ageing epidermal tissue. It stimulates basal epidermal keratinocytes and increases the biosynthesis of epidermal intermediates critical to the formation of a fully functioning stratum corneum.

Niacinamide helps to prevent UV-induced deleterious molecular and immunological events, supporting work in animal models demonstrate clearly the ability of niacinamide to significantly reduce photoimmunesuppression.

Niacinamide inhibits the transfer of melanosomes from melanocytes to keratinocytes. This could lead to a reduction in pigmentation with time without inhibitory effects on melanocyte tyrosinase activity.

Niacinamide is delivered effectively from a range of vehicles. From various formulations approximately 10 to 29% of the starting dose were detected after 1 to 2 days.

### **In-vivo studies:**

Niacinamide in concentrations of 2 to 5% reduces human skin hyperpigmentation and facial spots formation.

Niacinamide regulates sebaceous lipid and consequently acne. Topical niacinamide in the form of a commercial 4% gel has been shown to provide potent anti-inflammatory activity in the treatment of acne vulgaris while bacterial resistance is lacking. In-vitro Niacinamide produced significant dose-dependent reductions in total sebaceous lipogenesis and reductions in both triglyceride and fatty acid synthesis.

Niacinamide exerts multiple benefits on the appearance of ageing and photodamaged skin. A significant improvement in skin texture appearance over the application of a 5% niacinamide product was seen in women aged 35 to 60 years. The appearance shifted towards the finer, anisotropic features characteristic of younger skin while the appearance of hyperpigmented spots was significant improved.

**Literature:** \*Matts P.J.: A review of the range of effects of niacinamide in human skin. IFSCC Mag. 5(4), 285-289. 2002  
Gensler H.L.: Prevention of photoimmunosuppression a. photocarcinogenesis by topical nicotinamide. Nutr & Cancer 29(2), 157-162. 1997

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