Crospovidone

1 Nonproprietary Names

BP: Crospovidone
PhEur: Crospovidonum
USPNF: Crospovidone

2 Synonyms

Crosslinked povidone; E1202; *Kollidon CL*; *Kollidon CL-M*; *Polyplasdone XL*; *Polyplasdone XL-10*; polyvinylpolypyrrolidone; PVPP; 1-vinyl-2-pyrrolidinone homopolymer.

3 Chemical Name and CAS Registry Number

1-Ethenyl-2-pyrrolidinone homopolymer [9003-39-8]

4 Empirical Formula Molecular Weight

$(C_6H_9NO)_n$ >1 000 000

Crospovidone is a water-insoluble synthetic crosslinked homopolymer of *N*-vinyl-2-pyrrolidinone. An exact determination of the molecular weight has not been established because of the insolubility of the material.

5 Structural Formula

See Povidone.

6 Functional Category

Tablet disintegrant.

7 Applications in Pharmaceutical Formulation or Technology

Crospovidone is a water-insoluble tablet disintegrant and dissolution agent used at 2–5% concentration in tablets prepared by direct-compression or wet- and dry-granulation methods.[1–4] It rapidly exhibits high capillary activity and pronounced hydration capacity, with little tendency to form gels. Studies suggest that the particle size of crospovidone strongly influences disintegration of analgesic tablets.[5] Larger particles provide a faster disintegration than smaller particles. Crospovidone can also be used as a solubility enhancer. With the technique of co-evaporation, crospovidone can be used to enhance the solubility of poorly soluble drugs. The drug is adsorbed on to crospovidone in the presence of a suitable solvent and the solvent is then evaporated. This technique results in faster dissolution rate.

8 Description

Crospovidone is a white to creamy-white, finely divided, free-flowing, practically tasteless, odorless or nearly odorless, hygroscopic powder.

9 Pharmacopeial Specifications

See Table I.

Table I: Pharmacopeial specifications for crospovidone.

Test	PhEur 2002	USPNF 20 (Suppl 1)
Identification	+	+
Characters	+	—
pH (1% suspension)	—	5.0–8.0
Water	—	≤5.0%
Residue on ignition	≤0.1%	≤0.4%
Water-soluble substances	≤1.0%	≤1.5%
Peroxides	≤400 ppm	—
Heavy metals	≤10 ppm	≤0.001%
Vinylpyrrolidinone	—	≤0.1%
Loss on drying	≤5.0%	—
Nitrogen content (anhydrous basis)	11.0–12.8%	11.0–12.8%

10 Typical Properties

Acidity/alkalinity: pH = 5.0–8.0 (1% w/v aqueous slurry)
Density: 1.22 g/cm^3
Density (bulk): *see* Table II.
Density (tapped): *see* Table II.

Table II: Density values of commercial grades of crospovidone.

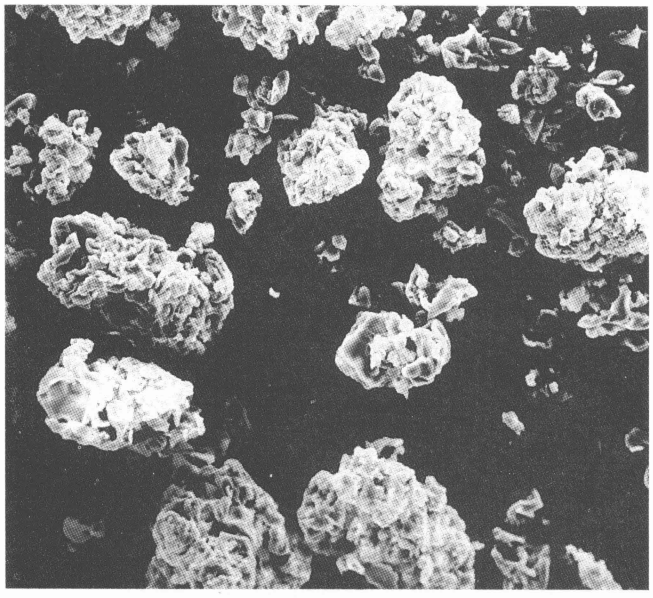
Commercial grade	Density (bulk) g/cm^3	Density (tapped) g/cm^3
Kollidon CL	0.3–0.4	0.4–0.5
Kollidon CL-M	0.15–0.25	0.3–0.5
Polyplasdone XL	0.213	0.273
Polyplasdone XL-10	0.323	0.461

Moisture content: maximum moisture sorption is approximately 60%.
Particle size distribution: less than 400 μm for *Polyplasdone XL*; less than 74 μm for *Polyplasdone XL-10*. Approximately 50% greater than 50 μm and maximum of 3% greater than 250 μm in size for *Kollidon CL*. Minimum of 90% of particles are below 15 μm for *Kollidon CL-M*.
Solubility: practically insoluble in water and most common organic solvents.
Specific surface area: *see* Table III.

Table III: Specific surface areas for commercial grades of crospovidone.

Commercial grade	Surface area (m^2/g)
Kollidon CL	1.0
Kollidon CL-M	3.0–6.0
Polyplasdone XL	0.6–0.8
Polyplasdone XL-10	1.2–1.4

SEM 1
Excipient: Crospovidone (*Polyplasdone XL-10*)
Manufacturer: ISP Corp.
Lot No.: S81031
Magnification: 400×
Voltage: 10 kV



11 Stability and Storage Conditions

Since crospovidone is hygroscopic, it should be stored in an airtight container in a cool, dry place.

12 Incompatibilities

Crospovidone is compatible with most organic and inorganic pharmaceutical ingredients. When exposed to a high water level, crospovidone may form molecular adducts with some materials; *see* Povidone.

13 Method of Manufacture

Acetylene and formaldehyde are reacted in the presence of a highly active catalyst to form butynediol, which is hydrogenated to butanediol and then cyclodehydrogenated to form butyrolactone. Pyrrolidone is produced by reacting butyrolactone with ammonia. This is followed by a vinylation reaction in which pyrrolidone and acetylene are reacted under pressure. The monomer vinylpyrrolidone is then polymerized in solution, using a catalyst. Crospovidone is prepared by a 'popcorn polymerization' process.

14 Safety

Crospovidone is used in oral pharmaceutical formulations and is generally regarded as a nontoxic and nonirritant material. Short-term animal toxicity studies have shown no adverse effects associated with crospovidone.[6] However, owing to the lack of available data, an acceptable daily intake in humans has not been specified by the WHO.[6]

LD_{50} (mouse, IP): 12 g/kg

15 Handling Precautions

Observe normal precautions appropriate to the circumstances and quantity of material handled. Eye protection, gloves, and a dust mask are recommended.

16 Regulatory Status

Accepted for use as a food additive in Europe. Included in the FDA Inactive Ingredients Guide (oral capsules and tablets; topical, transdermal, and vaginal preparations). Included in nonparenteral medicines licensed in the UK.

17 Related Substances

Povidone.

18 Comments

Crospovidone has been studied as a superdisintegrant. The ability of the compound to swell has been examined directly using scanning electron microscopy.[7] The impact of crospovidone on percolation has also been examined.[8] The impact of crospovidone on dissolution of poorly soluble drugs in tablets has also been investigated.[9]

19 Specific References

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20 General References

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22 Date of Revision

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