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Methacrylic Acid - Ethyl Acrylate Copolymer (1:1)

General Notices

(Ph. Eur. monograph 1128)

Action and use

Pharmaceutical aid.

Ph Eur

DEFINITION

Copolymer of methacrylic acid and ethyl acrylate having a mean relative molecular mass of about 250 000. The ratio of carboxylic groups to ester groups is about 1:1. The substance is in the acid form (type A) or partially neutralised using sodium hydroxide (type B). It may contain suitable surface-active agents such as sodium dodecyl sulfate and polysorbate 80.

Content

— *type A*: 46.0 per cent to 50.6 per cent of methacrylic acid units (dried substance);

— *type B*: 43.0 per cent to 48.0 per cent of methacrylic acid units (dried substance).

CHARACTERS

Appearance

White or almost white, free-flowing powder.

Solubility

Practically insoluble in water (type A) or dispersible in water (type B), freely soluble in anhydrous ethanol, practically insoluble in ethyl acetate. It is freely soluble in a 40 g/L solution of sodium hydroxide.

IDENTIFICATION

A. Infrared absorption spectrophotometry (*2.2.24*).

Preparation Dissolve 0.1 g of the substance to be examined in 1 mL of *ethanol (90 per cent V/V) R* and place 2 drops of the solution on a sodium chloride plate; dry to allow the formation of a film and cover with another sodium chloride plate.

Comparison *methacrylic acid - ethyl acrylate copolymer (1:1) - type A CRS* or *methacrylic acid - ethyl acrylate copolymer (1:1) - type B CRS*.

B. It complies with the limits of the assay.
C. Sulfated ash (see Tests).

TESTS

Viscosity (*2.2.10*)

— *Type A*: 100 mPa·s to 200 mPa·s.

Dissolve a quantity of the substance to be examined corresponding to 37.5 g of the dried substance in a mixture of 7.9 g of *water R* and 254.6 g of *2-propanol R*. Determine the viscosity at 20 °C using a rotating viscometer at a shear rate of 10 s^{-1}.

— *Type B*: maximum 100 mPa·s.

Disperse a quantity of the substance to be examined corresponding to 80.0 g of the dried substance in *water R* and make up to 400 g with the same solvent. Stir for 3 h and determine the viscosity at 23 °C using a rotating viscometer and a spindle rotating at 100 r/min.

Dimensions of the spindle Diameter = 47.0 mm; height = 27.0 mm; shaft diameter = 3.18 mm.

Appearance of a film

Spread 1 mL of the solution (type A) or dispersion (type B) prepared for the test for viscosity on a glass plate and allow to dry. A clear, brittle film is formed.

Ethyl acrylate and methacrylic acid

Liquid chromatography (*2.2.29*).

Solution A Dissolve 3.5 g of *sodium perchlorate R* in *water R* and dilute to 100.0 mL with the same solvent.

Blank solution *methanol R*, solution A (50:50 *V/V*).

Test solution Dissolve 3.0 g of the substance to be examined in *methanol R* and dilute to 50.0 mL with the same solvent. To 5.0 mL of solution A add 5.0 mL of the solution dropwise whilst stirring continuously. Centrifuge until a clear supernatant is obtained. Use the clear supernatant as the test solution.

Reference solution Dissolve 50.0 mg of *ethyl acrylate R* and 50.0 mg of *methacrylic acid R* in 5 mL of *butanol R* and dilute to 100.0 mL with *methanol R*. Dilute 1.0 mL of the solution to 100.0 mL with *methanol R*. Dilute 2.0 mL of this solution to 10.0 mL with *methanol R*. Mix 5.0 mL of this solution and 5.0 mL of solution A.

Column:

— *size*: *l* = 0.125 m, Ø = 4.6 mm;

— *stationary phase*: *end-capped octadecylsilyl silica gel for chromatography R* (7 µm).

Mobile phase Mix 20 volumes of *methanol R2* and 80 volumes of *water for chromatography R* previously adjusted to pH 2.0 with *phosphoric acid R*.

Flow rate 2.0 mL/min.

Detection Spectrophotometer at 202 nm.

Injection 20 µL.

Retention time Methacrylic acid = about 3 min; ethyl acrylate = about 9 min.

System suitability:

— *resolution*: minimum 5.0 between the peaks due to methacrylic acid and ethyl acrylate in the chromatogram obtained with the reference solution;

— the chromatogram obtained with the blank solution does not show peaks with the same retention times as ethyl acrylate or methacrylic acid.

Calculation of percentage contents:

— for ethyl acrylate and methacrylic acid, use the respective concentration of these substances in the reference solution.

Limit:

— *sum of the contents of ethyl acrylate and methacrylic acid*: maximum 0.01 per cent;

— *reporting threshold*: 1 ppm.

Loss on drying (*2.2.32*)

Maximum 5.0 per cent, determined on 1.000 g by drying in an oven at 105 °C for 6 h.

Sulfated ash (*2.4.14*)

Maximum 0.4 per cent (type A) or 0.5 per cent to 3.0 per cent (type B), determined on 1.0 g.

ASSAY

Dissolve 1.000 g in a mixture of 40 mL of *water R* and 60 mL of *2-propanol R*. Titrate slowly while stirring with *0.5 M sodium hydroxide*, using *phenolphthalein solution R* as indicator.

1 mL of *0.5 M sodium hydroxide* is equivalent to 43.05 mg of $C_4H_6O_2$ (methacrylic acid units).

LABELLING

The label states the type (type A or type B).

FUNCTIONALITY-RELATED CHARACTERISTICS

This section provides information on characteristics that are recognised as being relevant control parameters for one or more functions of the substance when used as an excipient (see chapter 5.15). Some of the characteristics described in the Functionality-related characteristics section may also be present in the mandatory part of the monograph since they also represent mandatory quality criteria. In such cases, a

cross-reference to the tests described in the mandatory part is included in the Functionality-related characteristics section. Control of the characteristics can contribute to the quality of a medicinal product by improving the consistency of the manufacturing process and the performance of the medicinal product during use. Where control methods are cited, they are recognised as being suitable for the purpose, but other methods can also be used. Wherever results for a particular characteristic are reported, the control method must be indicated.

The following characteristics may be relevant for methacrylic acid - ethyl acrylate copolymer (1:1) used as gastro-resistant coating agent.

Viscosity

(see Tests).

Appearance of a film

(see Tests).

Solubility of a film

Take a piece of the film obtained in the test for appearance of a film (see Tests), place it in a flask containing a 10.3 g/L solution of *hydrochloric acid R* and stir; it does not dissolve within 2 h. Take another piece of the film, place it in a flask containing *phosphate buffer solution pH 6.0 R* and stir; it dissolves within 1 h.
