

01/2005:1443

01/2005:2052

MACROGOL 6 GLYCEROL CAPRYLOCAPRATE

Macrogol 6 glyceroli caprylocapras

DEFINITION

Macrogol 6 glycerol caprylocaprate is a mixture of mainly mono- and diesters of polyoxyethylene glycerol ethers mainly with caprylic (octanoic) and capric (decanoic) acids. The average content of the ethylene oxide is 6 units per molecule. Macrogol 6 glycerol caprylocaprate may be obtained by ethoxylation of glycerol and esterification with distilled coconut or palm kernel fatty acids, or by ethoxylation of mono- and diglycerides of caprylic and capric acids.

CHARACTERS

A pale yellow liquid, partly soluble in water, freely soluble in castor oil, in glycerol, in isopropanol and in propylene glycol. It has a viscosity of about 145 mPas.

IDENTIFICATION

- Dissolve 1.0 g in 99 g of a mixture of 10 volumes of *2-propanol R* and 90 volumes of *water R*. Heat the solution obtained to about 40 °C. A turbidity is produced. Allow to cool until the turbidity disappears. The cloud point is between 15 °C and 35 °C.
- It complies with the test for saponification value (see Tests).
- It complies with the test for composition of fatty acids (see Tests).

TESTS

Appearance. The substance to be examined is clear (2.2.1) and not more intensely coloured than reference solution Y_2 (2.2.2, Method I).

Alkalinity. Dissolve 2.0 g in a hot mixture of 10 ml of *alcohol R* and 10 ml of *water R*. Add 0.1 ml of *bromothymol blue solution R1*. Not more than 0.5 ml of 0.1 M *hydrochloric acid* is required to change the colour of the indicator to yellow.

Acid value (2.5.1). Not more than 5.0, determined on 5.0 g.

Hydroxyl value (2.5.3, Method A): 165 to 225.

Saponification value (2.5.6): 85 to 105, determined on 2.0 g.

Composition of fatty acids (2.4.22, Method A). The fatty acid fraction has the following composition:

- *caproic acid*: not more than 2.0 per cent,
- *caprylic acid*: 50.0 per cent to 80.0 per cent,
- *capric acid*: 20.0 per cent to 50.0 per cent,
- *lauric acid*: not more than 3.0 per cent,
- *myristic acid*: not more than 1.0 per cent.

Ethylene oxide and dioxan (2.4.25). Not more than 1 ppm of ethylene oxide and not more than 10 ppm of dioxan.

Water (2.5.12). Not more than 1.0 per cent, determined on 1.00 g by the semi-micro determination of water.

Total ash (2.4.16). Not more than 0.3 per cent, determined on 1.0 g.

MACROGOL 15 HYDROXYSTEARATE

Macrogoli 15 hydroxystearas

DEFINITION

Mixture of mainly monoesters and diesters of 12-hydroxystearic acid and macrogols obtained by ethoxylation of 12-hydroxystearic acid. The number of moles of ethylene oxide reacted per mole of 12-hydroxystearic acid is 15 (nominal value). It contains free macrogols.

CHARACTERS

Appearance: yellowish, waxy mass.

Solubility: very soluble in water, soluble in alcohol, insoluble in liquid paraffin.

It solidifies at about 25 °C.

IDENTIFICATION

- Thin-layer chromatography (2.2.27).

Test solution. To 1.0 g add 100 ml of a 100 g/l solution of *potassium hydroxide R* and boil under a reflux condenser for 30 min. Acidify the warm solution with 20 ml of *hydrochloric acid R* and cool to room temperature. Shake the mixture with 50 ml of *ether R* and allow to stand until a separation of the layers is visible. Separate the clear upper layer, add 5 g of *anhydrous sodium sulphate R*, wait for 30 min, filter and evaporate to dryness on a water-bath. Dissolve 50 mg of the residue in 25 ml of *ether R*.

Reference solution. Dissolve 50 mg of *12-hydroxystearic acid R* in 25 ml of *methylene chloride R*.

Plate: *octadecylsilyl silica gel for chromatography R* as the coating substance.

Mobile phase: *methylene chloride R*, *glacial acetic acid R*, *acetone R* (10:40:50 V/V/V).

Application: 2 µl.

Development: over 2/3 of the plate.

Drying: in a current of cold air.

Detection: spray with a 80 g/l solution of *phosphomolybdic acid R* in *2-propanol R* and heat at 120 °C for 1-2 min.

Results: the principal spot in the chromatogram obtained with the test solution is similar in position and colour to the principal spot in the chromatogram obtained with the reference solution.

- Dissolve 15.0 g in 50 ml of *water R*. The viscosity (2.2.9) has a maximum of 20 mPas.
- It complies with the test for free macrogols (see Tests).

TESTS

Appearance of solution. The solution is not more opalescent than reference suspension III (2.2.1) and not more intensely coloured than reference solution B_6 or BY_6 (2.2.2, Method II). Dissolve 2.0 g in *water R* and dilute to 20 ml with the same solvent.

Acid value (2.5.1): maximum 1.0, determined on 2.0 g.

Hydroxyl value (2.5.3, Method A): 90 to 110.

Iodine value (2.5.4): maximum 2.0.

Peroxide value (2.5.5, Method A): maximum 5.0.

Saponification value (2.5.6): 53 to 63.

01/2005:2044

Free macrogols. Size-exclusion chromatography (2.2.30).

Test solution. Dissolve 1.20 g of the substance to be examined in the mobile phase and dilute to 250.0 ml with the mobile phase.

Reference solution (a). Dissolve about 0.4 g of *macrogol 1000 R* in the mobile phase and dilute to 250.0 ml with the mobile phase.

Reference solution (b). Dilute 50.0 ml of reference solution (a) to 100.0 ml with the mobile phase.

Precolumns (2):

- size: $l = 0.125$ m, $\varnothing = 4$ mm,
- stationary phase: spherical octadecylsilyl silica gel for chromatography R (5 μ m) with a pore size of 10 nm.

Column:

- size: $l = 0.30$ m, $\varnothing = 7.8$ mm,
- stationary phase: hydroxylated polymethacrylate gel R (6 μ m) with a pore size of 12 nm.

Connect both precolumns to the column using a 3-way valve and switch the mobile phase flow according to the following programme:

- 0-114 s: precolumn 1 and column,
- 115 s to the end: precolumn 2 and column,
- 115 s to 7 min: flow back of precolumn 1.

Mobile phase: water R, methanol R (2:8 V/V).

Flow rate: 1.1 ml/min.

Detection: refractometer.

Injection: 50 μ l.

Calculate the percentage content of free macrogols using the following expression:

$$\frac{A_1 \times m_2 \times 200}{m_1 \times (A_2 + 2A_3)}$$

- m_1 = mass of the substance to be examined in the test solution, in grams,
- m_2 = mass of *macrogol 1000 R* in reference solution (a), in grams,
- A_1 = area of the peak due to free macrogols in the substance to be examined in the chromatogram obtained with the test solution,
- A_2 = area of the peak due to *macrogol 1000* in the chromatogram obtained with reference solution (a),
- A_3 = area of the peak due to *macrogol 1000* in the chromatogram obtained with reference solution (b).

Limit:

- free macrogols: 27.0 per cent to 39.0 per cent.

Ethylene oxide and dioxan (2.4.25): maximum 1 ppm of ethylene oxide and maximum 50 ppm of dioxan.

Nickel (2.4.27): maximum 1 ppm.

Water (2.5.12): maximum 1.0 per cent, determined on 2.00 g.

Total ash (2.4.16): maximum 0.3 per cent, determined on 1.0 g.

STORAGE

In an airtight container.

MACROGOL 20 GLYCEROL MONOSTEARATE

Macrogol 20 glyceroli monostearas

DEFINITION

Macrogol 20 glycerol monostearate is obtained by ethoxylation with ethylene oxide of different types of glycerol stearates, mainly *Glycerol monostearate 40-55 (0495)*. The number of moles of ethylene oxide reacted per mole of glycerol stearate is 20 (nominal value).

CHARACTERS

Appearance: pale yellow, oily liquid or gel.

Solubility: soluble in water at 40 °C and above and in alcohol, practically insoluble in light liquid paraffin and in fatty oils.

Relative density: about 1.07.

IDENTIFICATION

- A. It complies with the test for hydroxyl value (see Tests).
- B. It complies with the test for saponification value (see Tests).
- C. It complies with the test for composition of fatty acids (see Tests).
- D. Place 1 g in a test-tube and add 0.1 ml of *sulphuric acid R*. Heat the tube until white fumes appear. The fumes turn filter paper impregnated with *alkaline potassium tetraiodomercurate solution R* black.

TESTS

Acid value (2.5.1): maximum 2.0, determined on 5.0 g.

Hydroxyl value (2.5.3, Method B): 65 to 85, determined on 0.350 g.

Iodine value (2.5.4): maximum 2.0.

Peroxide value (2.5.5): maximum 6.0.

Saponification value (2.5.6): 40 to 60.

Composition of fatty acids. Gas chromatography (2.4.22, Method C).

Composition of the fatty acid fraction of the substance:

Type of macrogol 20 glycerol monostearate	Type of glycerol stearate used	Composition of fatty acids
Type I	Type I (obtained using stearic acid 50)	<i>Stearic acid:</i> 40.0 per cent to 60.0 per cent, <i>Sum of the contents of palmitic and stearic acids:</i> minimum 90.0 per cent.
Type II	Type II (obtained using stearic acid 70)	<i>Stearic acid:</i> 60.0 per cent to 80.0 per cent, <i>Sum of the contents of palmitic and stearic acids:</i> minimum 90.0 per cent.
Type III	Type III (obtained using stearic acid 95)	<i>Stearic acid:</i> 90.0 per cent to 99.0 per cent, <i>Sum of the contents of palmitic and stearic acids:</i> minimum 96.0 per cent.

Ethylene oxide and dioxan (2.4.25, Method A): maximum 1 ppm of ethylene oxide and 10 ppm of dioxan.

Heavy metals (2.4.8): maximum 10 ppm.

2.0 g complies with limit test C. Prepare the standard using 2 ml of *lead standard solution (10 ppm Pb) R*.