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Polyoxyl 10 Oleyl Ether

Polyoxy-1,2-ethanediyl, α-(*Z*)-9-octadecenyl-ω-hydroxy-;
Polyethylene glycol monooleyl ether
CAS RN®: 9004-98-2.

DEFINITION

Polyoxyl 10 Oleyl Ether is a mixture of the mono-oleyl ethers of mixed polyoxyethylene diols, the average polymer length being equivalent to NLT 9.1 and NMT 10.9 oxyethylene units. It may contain suitable stabilizers.

IDENTIFICATION

Change to read:

• **A.** ▲Spectroscopic Identification Tests ⟨197⟩, *Infrared Spectroscopy*: **197F** ▲ (CN 1-May-2020)

Sample: Use undried specimen.

Acceptance criteria: Meets the requirements

IMPURITIES

• Residue on Ignition ⟨281⟩

Sample: 25 g

Analysis: Weigh the *Sample* into a tared 40-mL porcelain crucible, and heat in contact with air until it ignites spontaneously or can be ignited with a glowing splint. Allow the flame to go out, and place the crucible in a muffle furnace with the door partly open until the carbon is consumed. Close the door, and heat at 700 ± 100° for 1 h. Cool in a desiccator, weigh, and calculate the percentage of residue. If it exceeds 0.4%, again heat until constant weight is attained.

Acceptance criteria: NMT 0.4%

• **Free Polyethylene Glycols**

Sample solution: Transfer 12 g to a 500-mL separator containing 50 mL of ethyl acetate. Add 50 mL of sodium chloride solution (0.29 g/mL), shake vigorously for 2 min, and allow to separate for 15 min. Drain the lower, aqueous phase into a second 500-mL separator, and extract the upper layer with a second 50-mL portion of sodium chloride solution (0.29 g/mL). To the combined aqueous layers add 50 mL of ethyl acetate, shake vigorously for 2 min, and allow to separate as before. Drain the lower, aqueous phase into a third 500-mL separator, and extract with two 50-mL portions of chloroform by shaking for 2 min each time.

Analysis: Evaporate the combined chloroform extracts in a 150-mL beaker on a steam bath, with the aid of a stream of nitrogen, to apparent dryness. Redissolve in 15 mL of chloroform, and transfer to a filter, collecting the filtrate in a 150-mL beaker. Rinse the funnel with several small portions of chloroform, and evaporate the combined filtrate and rinsings, as described above, until no odor of chloroform or ethyl acetate is perceptible. Cool in a desiccator, and weigh.

Acceptance criteria: NMT 7.5%

• **Free Ethylene Oxide**

Internal standard solution: 100 mg/mL of *n*-butyl chloride in chlorobenzene. Store in a tightly closed container. Prepare fresh weekly.

Standard stock solution

[Caution—Ethylene oxide is toxic and flammable. Prepare this solution in a well-ventilated hood, using great care.]

Place 250 mL of chlorobenzene in a glass-stoppered 500-mL conical flask. Bubble ethylene oxide through the chlorobenzene at a moderate rate for 30 min, insert the stopper, and store with protection from heat. Pipet 25 mL of 0.5 N alcoholic hydrochloric acid solution, prepared by mixing 45 mL of hydrochloric acid with 1 L of alcohol, into a 500-mL conical flask containing 40 g of magnesium chloride hexahydrate. Shake the mixture to effect saturation. Pipet 10 mL of the ethylene oxide solution into the flask, and add 20 drops of bromocresol green TS. If the solution is not yellow (acid) at this point, add an additional volume of 0.5 N alcoholic hydrochloric acid to give an excess of 10 mL. Record the total volume of 0.5 N alcoholic hydrochloric acid added. Insert the stopper in the flask, and allow to

stand for 30 min. Titrate the excess acid with 0.5 N alcoholic potassium hydroxide VS. Perform a blank titration, using 10.0 mL of chlorobenzene instead of ethylene oxide solution, adding the same total volume of 0.5 N alcoholic hydrochloric acid, and note the difference in volumes required. Each mL of the difference in volumes of 0.5 N alcoholic potassium hydroxide consumed is equivalent to 22.02 mg of ethylene oxide. Calculate the concentration, in mg/mL, of ethylene oxide in the *Standard stock solution.* Standardize daily.

Standard solution: Transfer 5 g of Polyoxyl 10 Oleyl Ether to a suitable glass bottle of 60-mL capacity, and add 10 mL of chlorobenzene, exactly 50 µL of *Internal standard solution,* and a volume of *Standard stock solution* containing 0.5 mg of ethylene oxide. Insert a magnetic stirring bar, cap the bottle tightly, and stir until homogeneity is attained.

Sample solution: Transfer 5 g of Polyoxyl 10 Oleyl Ether to a suitable glass bottle of 60-mL capacity, and add 10 mL of chlorobenzene and 50 µL of *Internal standard solution*. Add a volume of chlorobenzene equal to the volume of the *Standard stock solution* added to prepare the *Standard solution.* Insert a magnetic stirring bar, cap the bottle tightly, and stir until homogeneity is attained.

Interference check solution: Transfer 5 g of Polyoxyl 10 Oleyl Ether to a suitable glass bottle of 60-mL capacity, and add 10 mL of chlorobenzene. Add a volume of chlorobenzene equal to the volume of the *Standard stock solution* used to prepare the *Standard solution.* Insert a magnetic stirring bar, cap the bottle tightly, and stir until homogeneity is attained.

Chromatographic system

(See *Chromatography ⟨621⟩, System Suitability*.)

Mode: GC

Detector: Flame ionization

Column: 3-mm (OD) × 1.8-m stainless steel packed with S3

Temperatures

Injection port: 210°

Detector: 230°

Column: 160°

Carrier gas: Helium

Flow rate: 66 mL/min

Injection volume: 2 µL

System suitability

Samples: Chlorobenzene, *Internal standard solution, Standard stock solution,* and *Interference check solution*

Interference check: Inject a suitable volume of chlorobenzene into the gas chromatograph, and allow the chromatogram to run until the solvent has eluted. Similarly inject and chromatograph the *Internal standard solution,* the *Standard stock solution,* and the *Interference check solution.* No interfering peaks are observed.

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the weight of ethylene oxide in the portion of sample taken:

$$W_T = (W_E \times W_U \times R_U)/[(W_U \times R_S) - (W_S \times R_U)] \times F$$

W_E = weight of ethylene oxide added to the *Standard solution* (mg)

W_U = weight of Polyoxyl 10 Oleyl Ether used to prepare the *Sample solution* (g)

R_U = peak area ratio of ethylene oxide to the internal standard for the *Sample solution*

R_S = peak area ratio of ethylene oxide to the internal standard for the *Standard solution*

W_S = weight of Polyoxyl 10 Oleyl Ether used to prepare the *Standard solution* (g)

F = unit conversion, mg to g (10^{-3})

Calculate the percentage of ethylene oxide in the portion of Polyoxyl 10 Oleyl Ether taken:

$$\text{Result} = (W_T/W_U) \times 100$$

W_T and W_U are as defined above.

Acceptance criteria: NMT 0.01%

SPECIFIC TESTS

- **Water Determination,** *Method I ⟨921⟩*: NMT 3.0%
- **Fats and Fixed Oils,** *Acid Value ⟨401⟩*: NMT 1.0.

- **Fats and Fixed Oils,** *Hydroxyl Value* ⟨401⟩**:** 75–95
- **Fats and Fixed Oils,** *Iodine Value, Method I* ⟨401⟩
  Sample: 550 mg
  Analysis: Proceed as directed in the chapter, with the reaction time being extended to 60 min.
  Acceptance criteria: 23–40
- **Fats and Fixed Oils,** *Saponification Value* ⟨401⟩**:** NMT 3
- **Average Polymer Length**
  Sample solution: If solid material is present, place the Polyoxyl 10 Oleyl Ether in a 60° water bath overnight. Shake vigorously to eliminate any possibility of molecular weight gradients within it. Add 1 mL of the melt to 1 mL of deuterated chloroform in a test tube, and shake the test tube until dissolution is complete. Transfer 0.5 mL to an NMR tube, and add a small amount of tetramethylsilane as an internal reference standard. Cap the tube tightly, and shake thoroughly.
  Analysis: Place the tube in an NMR spectrometer that is capable of performing quantitative analysis, and record the NMR spectrum (see *Nuclear Magnetic Resonance Spectroscopy* ⟨761⟩*, Quantitative Applications*). Integrate the areas from 0.4 to 2.35 ppm (A_1), and from 2.35 to 4.9 ppm (A_2).
  Calculate the number of oxyethylene units per molecule taken:

$$\text{Result} = [(31 \times A_2/A_1) - 3]/4$$

  31 = total number of protons in the molecule not activated by either oxygen or a double bond
  3 = number of oxygen-activated protons not included in the oxyethylene unit count
  4 = number of protons in each oxyethylene unit

  Acceptance criteria: 9.1–10.9

ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in tight containers, and store in a cool place.
- **Labeling:** Label to indicate the names and proportions of any added stabilizers.
- **USP Reference Standards** ⟨11⟩
  USP Polyoxyl 10 Oleyl Ether RS

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
POLYOXYL 10 OLEYL ETHER	Documentary Standards Support	CE2020 Complex Excipients
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	CE2020 Complex Excipients

Chromatographic Database Information: Chromatographic Database

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