POLYOXYETHYLENE (20) SORBITAN MONOOLEATE


SYNONYMS
Polysorbate 80; INS No. 433

DEFINITION
Consists of a mixture of the partial esters of sorbitol and its mono- and dianhydrides (which have an acid value below 7.5 and a water content below 0.2%) with edible commercial oleic acid and condensed with approximately 20 moles of ethylene oxide per mole of sorbitol and its anhydrides.

C.A.S. number
9005-65-6

Structural formula
Nominal formula and approximate composition:

\[
\begin{align*}
\text{H} & \quad \text{O} \\
\text{H} & \quad \text{C} \quad \text{O}(	ext{C}_2\text{H}_4\text{O})_w\text{H} \\
\text{H} & \quad \text{O}(	ext{C}_2\text{H}_4\text{O})_x\text{CH} \\
\text{H} & \quad \text{O}(	ext{C}_2\text{H}_4\text{O})_y\text{H} \\
\text{CH}_2\text{O}(	ext{C}_2\text{H}_4\text{O})_z\text{CRC}
\end{align*}
\]

where \( w + x + y + z = \text{approx. 20} \) and \( \text{RCO}^- \) is the fatty acid moiety

Assay
Not less than 65.0 and not more than 69.5% of oxyethylene groups, equivalent to not less than 96.5 and not more than 103.5% of polyoxyethylene (20) sorbitan monooleate, calculated on the anhydrous basis.

DESCRIPTION
Lemon to amber coloured oily liquid at 25°, with a faint characteristic odour

FUNCTIONAL USES
Emulsifier, dispersing agent

CHARACTERISTICS

IDENTIFICATION
Solubility (Vol. 4)
Soluble in water, ethanol, methanol, ethyl acetate and toluene; insoluble in mineral oil and petroleum ether

Infrared absorption
The infrared spectrum of the sample is characteristic of a partial fatty acid ester of a polyoxyethylated polyol

Colour reaction
To 5 ml of a 5% (w/v) aqueous solution of the sample add 10 ml of ammonium cobaltithiocyanate solution and 5 ml of chloroform, shake well and allow to separate; a blue colour is produced in the chloroform layer. (Ammonium cobaltithiocyanate solution: 37.5 g of cobalt nitrate and 150 g
of ammonium thiocyanate made up to 100 ml with water - freshly prepared).

**Test for fatty acids**
To 5 ml of a 5% (w/v) aqueous solution of the sample add 5 ml sodium hydroxide TS. Boil for a few min, cool, and acidify with dilute hydrochloric acid. The solution is strongly opalescent, owing to the fatty acids liberated.

**Test for unsaturation**
To a solution of the sample (1 in 20) add bromine TS dropwise. The bromine is decolourized.

**Gelatinization**
A mixture of 60 parts by volume of the sample and 40 parts of water yields a gelatinous mass at or below room temperature.

**Saponification** (Vol. 4)
100 g of the sample yields approximately 23 g of fatty acids and 75 g of polyols.

**PURITY**

**Water** (Vol. 4)
Not more than 3% (Karl Fischer Method)

**Sulfated ash** (Vol. 4)
Not more than 0.25%
Test 5 g of the sample

**Acid value** (Vol. 4)
Not more than 2

**Saponification value** (Vol. 4)
Not less than 45 and not more than 55

**Hydroxyl value** (Vol. 4)
Not less than 65 and not more than 80

**Lead** (Vol. 4)
Not more than 2 mg/kg
Determine using an atomic absorption technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4, “Instrumental Methods.”

**METHOD OF ASSAY**
Determine the content of *Oxyethylene groups.*