EUDRAGIT RS 100

4.1 Commercial form

Eudragit RS 100 (Type B) are described in the Pharmaceutical European monograph.

4.2 Chemical structure

Eudragit RS 100 is a copolymer of ethyl acrylate, methyl methacrylate and a low content of methacrylic acid ester with quaternary ammonium groups. The ammonium groups are present as salts and make the polymers permeable.

The average molecular mass is approx. 32000 g/mol.

CAS No: 33434 - 24 – 1

Chemical/IUPAC name: Poly (ethyl acrylate-co-methyl methacrylate-co-rimethylammonioethyl methacrylate chloride) 1:2:0.1.

4.3 Characters

Description:- Eudragit RL 100 and eudragit RS 100: colourless, clear to cloudy granules with a faint amine-like odour.

Solubility:- 1 g of the substances dissolves in 7 g aqueous methanol, ethanol and isopropyl alcohol (containing approx. 3 % water), as well as in acetone, ethyl acetate and
methylene chloride to give clear to cloudy solutions. The substances are practically insoluble in petroleum ether, 1 N sodium hydroxide and water.

**Product Form:** Granules

**Targeted Drug Release Area:** Time controlled release, pH independent

**Characteristics:**
- Customized release profile by combination of RL and RS grades in different ratios.
- Suitable for matrix structures.

### 4.4 Tests

**Test solution:** A 12.5 g dry substance is dissolved in a mixture of 60 % (w/w) isopropyl alcohol and 40 % (w/w) acetone is correspondence quantity of substances from this 12.5 % elucidation of the dry polymer is used for the test solution.

**Particle size:** At least 95 % less than 0.25 mm. The particle size is determined according to European Pharmacopoeia 2.1.4 or united state pharmacopoeia chapter 811 powder fineness.

**Film formation:** When the Test solution is spread onto a glass plate a clear film forms upon evaporation of the solvents.

**Dry substance / Residue on evaporation:** 1 g of the polymer is dried in an oven for 5 hrs in vacuum at 80 °C. Not less than 97.0 %.

**Loss on drying:** Max. 3.0 % according to "Dry substance / Residue on evaporation."

### 4.5 Assay

Eudragit RL100: 8.85 - 11.96 % ammoniomethacrylate units on dry substance.

Alkali value: 23.9 - 32.3 mg potassium hydroxide per g dry substances.

Eudragit RS100: 4.48 - 6.77 % ammoniomethacrylate units on DS. Alkali value: 12.1 - 18.3 mg potassium hydroxide per gram dry substances.
The assay is carry out granting to European Pharmacopoeia 2.2.20 "Potentiometric titration" or united state pharmacopoeia chapter 541 titrimetry.

1 g Eudragit RL100 or 2 g Eudragit RS 100 are dissolved in 96 ml glacial acetic acid and 4 ml water. Addition of 5 ml mercury (II) acetate solution (5 % solution in glacial acetic acid) in titrant 0.1 N parchloric acid is used. 1 ml 0.1 N parchloric acid corresponds to 20.772 mg ammoniomethacrylate units.

\[
\text{Ammoniomethacrylate units (\%) on DS} = \frac{\text{ml 0.1 N HClO}_4 \cdot 207.72}{\text{sample weight (g) \cdot DS (\%)}}
\]

The alkali value (AV) is defined similarly to the acid value. It states how many mg potassium hydroxide are equivalent to the basic groups contained in 1 g dry substance.

Alkali value (mg potassium hydroxide / g dry substance) = ammoniomethacrylate units (\%) \cdot 2.701

**European Pharmacopoeia:** Eudragit RL100: 8.9 - 12.3 % ammoniomethacrylate units on dry substance, eudragit RS 100 and RS PO: 4.5 - 7.0 % ammoniomethacrylate units on dry substance; according to the European Pharmacopoeia monograph.

**United state Pharmacopoeia:** Eudragit RL 100: 8.85 - 11.96 % ammoniomethacrylate units on dry substance, Eudragit RS 100: 4.48 - 6.77 % ammoniomethacrylate units on dry substance, according to the United state pharmacopoeia monograph

**Japanese Pharmacopoeia Excipients:** 0.27 - 0.80 % Nitrogen on dry substance according to the JPE monograph. ml 0.1 N HClO_4 \cdot 207.72 sample weight (g). dry substance (\%) 2004-09 3/4 INFO 7.7/E

**Viscosity / Apparent viscosity:** The viscosity of the Test solution is determined by means of a Brookfield viscometer. This is maximum 15 mPa.s.

**Refractive index:** The refractive index of the Test solution is determined 1.380-1.385 according to European Pharmacopoeia 2.2.6.
**Relative density:** The relative density of the Test solution is determined 0.816-0.836 according to European Pharmacopoeia 2.2.5.

### 4.6 Purity

**Sulphated ash / Residue on ignition**

1 g of the substances used for the test is determined maximum 0.1 % according to European Pharmacopoeia 2.4.14 or united state pharmacopoeia chapter 281 residue on ignition.

**Heavy metals**

Max. 20 ppm according to European Pharmacopoeia 2.4.8 method C or united state pharmacopoeia chapter 231 heavy metals method II. 1 g of the substances is used for the test.

**Arsenic**

1 g of the substances used for the test is determined maximum 2 ppm according to Japanese Pharmacopoeia method 3.

**Methanol**

The test is carry out on according to European Pharmacopoeia 2.4.24, sample preparation. 0.200 g of the substances is used for the test. Eudragit RL 100: max. 1.5 % Eudragit RS 100: max. 1.0 %.

**Monomers**

Ethyl acrylate: max. 100 ppm and methyl methacrylate max. 50 ppm according to the European Pharmacopoeia Or united state pharmacopoeia monograph.

**Microbial Count**

Total aerobic microbial count: max. $10^3$ CFU / g. Total combined yeasts and moulds count: max. $10^2$ CFU / g (Acceptance criteria according to European Pharmacopoeia 5.1.4 / united state pharmacopoeia chapter 1111 microbial quality of pharmaceutical preparation. The test is carrying out according to European Pharmacopoeia 2.6.12 or united state pharmacopoeia chapter 61 microbial examination of non-sterile product.)
Max. 1,000 CFU / g; Salmonella not detectable in 10 g, E. coli, S. aureus, Ps. aeruginosa not detectable in 1 g. The test is performed according to Ph. Eur. 2.6.12 microbial examination of non-sterile product and 2.6.13 test for specific micro-organism under section B.

4.7 Test for Identification

First identity testing:- The selective material must used for the tests for "Assay" and "Viscosity / Apparent viscosity."

Second identity testing:- To obtain a dry film of approx. 15mm thick for this a few drops of the Test solution are placed on a crystal disc (KBr, NaCl) and dried in vacuum for about 2 hours at 70 °C.

The characteristic bands of the keton C=O groups at 1,240-1,270 and 1,150 - 1,190 cm⁻¹, as well as the ester, ester vibration at 1,730 cm⁻¹. In addition, CHX vibrations can be discussed at 1,385, 1,450, 1,475 and 2,950 - 3,000 cm⁻¹.

4.8 Detection in dosage forms

The dosage forms are drawout using the listed solvents under "Solubility," if necessary after mashing. By filtration or centrifugation insoluble substances are isolated. The clear filtrate is heated down and the leftover part identified by IR spectroscopy.

4.9 Storage

Protect from high temperatures and moisture. Storage at Any temperature between 8 °C and 25 °C fulfils this requirement.

Eudragit RL 100 and eudragit RS 100 likely to form clumps at heated temperatures. This has no change on the quality. The clumps are easily broken up again.

4.10 Stability

The product is required minimum stability dates are given on their labels and batch-related analysis for certificates. Storage Stability data are available upon request (eudragit.evonik.com).

Suresh Gyan Vihar University, Jaipur
Hypromellose, also commonly known as hydroxypropyl methylcellulose (HPMC) is a coating agent and film-former used as an inactive ingredient in the pharmaceutical industry (Dave, 2011). It has also been used as a rate-controlling polymer for sustained-release dose forms. The cellulose derivatives, like HPMC and hydroxyethyl cellulose (HEC) are created through a reaction of cellulose with ethylene or propylene oxides or both to create these products.

4.11 Technical specifications

**Product**: Hydroxypropyl Methylcellulose, K100M USP

**Grade**

**CAS No**: 9004-65-3

![Figure. 15 Structure of HPMC](image)

**Synonym**: HPMC

**Class**: Excipients - Food Colors – Binders, Tableting and film-forming aids.

**Hazard**: Non-Regulated Material

**Methoxyl Content**: 19.0-24.0

**Hydroxypropyl Content**: 7.0-12.0

**Gelation temperature**: 70.0-90.0°C

**Loss on Drying**: 5.0max

**pH @ 25°C**: 5.0-8.0

**Heavy Metals**: 10 max

**Residue on Ignition**: 1.5 max
4.12 Properties

✓ Physical Appearance: HPMC is non ionic cellulose ether, Milky white or similar to white granular powder; odorless, flavorless.

✓ Properties: Soluble in cold water, glacial acetic acid, ethanol, methanol, propylene glycol slightly soluble in acetone, Almost insoluble in hot water, ethylene, ether and toluene, quickly dispersed in 80-90 water; aqueous solution is very stable in room temperature; has good wetting / dispersing / adhesive / thickening / emulsifying / water preserving / film-forming properties; can prevent the infiltration of grease; film formed has excellent flexibility and transparency; has good compatibility with other emulsifier; easy salting-out. These copolymers offers several advantages like non-toxic, biocompatible, biodegradable, high availability and low cost, ease of chemical modification along with exhibiting suitable controlled release characteristic of the controlled drug delivery system (Sannino, et al., 2009). The solution of HPMC has surface activity, high transparency, and stable performance. When heated at certain temperature, the solution becomes cloudy or forms flocculent gel. However, the solution becomes clear again after cooling. Different types of HPMC have different gelation temperatures. The solubility varies with the viscosity. The lower the viscosity, the higher solubility it has. The different types of HPMC are different in some properties and their solubility in water is not affected by pH.

✓ Apparent density: 0.25-0.70 g/mL, specific density: 1.31g/mL.

✓ Granularity: 100-mesh passing through rate≥98.5, 80-mesh passing through rate: 100%.
4.13 Features

- Water preserving capability: HPMC is a highly efficient water preserving agent; widely used in food, cosmetics and many other areas.
- Film-forming property: HPMC can form a transparent, flexible and soft thin film which can prevent the pain filtration of grease.
- Cohesion property: HPMC can be used as adhesive in drugs and food.

4.14 Application

It is widely used as thickener, adhesive, water preserving agent, film-forming agent in construction, building materials, dispersion coating, wallpaper paste, polymerization aids, leathers, printing ink and paper making etc. also used in petroleum drilling and daily use chemicals (www.parchem.com).

HPMC is used as water-retaining-agent in all kinds of compo materials, such as mortar, plaster, putty powder and other adhesive materials. It enhances the spread ability and the pump ability, lengthens the operable time of the wet materials.

HPMC is used as adhesive for tiles, marbles, plastic ornaments and plaster tone. It also reduces the dosage of cement. The water retention property of HPMC leads the pulp not to dry too quickly, avoids crackings after spreading, and enhances the intensity of the coating.