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Röhm Pharma Polymers

Enteric coatings with EUDRAGIT® L/S from aqueous dispersions.
Tablets coated with redispersed EUDRAGIT® S 100

Spraying process for the manufacture of taste- and odour-masking, colored enteric sealing coats with EUDRAGIT® S 100 finished in a Hi-Coater unit.

Operating method

The coating suspension is sprayed onto the rotating cores, which are prewarmed to about 30 °C, by means of an air spray gun. Spray rate, inlet air quantity and inlet air temperature are adjusted in such a way that spraying can be performed continuously. During the process, the tablets should be maintained at a temperature of approx 30 °C. Moisture-sensitive tablets are initially sealed at a reduced spray rate. It takes about 30 minutes to apply a thin sealing coat. Thereafter processing may be continued as usual.

Twinning, i.e. sticking together of tablets, can be avoided by adding suitable glidants (talc, magnesium stearate, kaolin) to the EUDRAGIT® S 100 spray suspension.
If twinning does occur, spraying must be interrupted until the tablets are dry and once more able to tumble freely. Subsequently, processing may be continued at a reduced spray rate.

The following polymers, dissolved in organic solvents, are recommended for subcoating of extremely water-sensitive active ingredients:

EUDRAGIT® E 12,5, EUDRAGIT® E 100 ; EUDRAGIT® RL/RS 12,5 ; EUDRAGIT® RL/RS 100 ; EUDRAGIT® L/S 12,5 ; EUDRAGIT® L/S 100 ; EUDRAGIT® L 100-55

Similarly to colloidal systems, aqueous dispersions are adversely affected by various factors. Coagulation may occur in the presence of electrolytes, organic solvents or finely dispersed pigments, due to changes in pH, foam formation, heat or frost, or high shear in high-speed mixers and mills.

Finely dispersed pigments in polymer dispersions may cause speckling. Added emulsifiers (polysorbate, polyethylene glycol, polyvinyl pyrrolidone, Na carboxymethylcellulose, etc.) have a stabilizing effect. When speckling leads to coagulation, these dispersions cannot be redispersed and must be discarded.
EUDRAGIT® L/S dispersions are incompatible with magnesium stearate (thickening or coagulation), but magnesium stearate contained in tablets affects neither the spray suspension nor the film properties.

Typical formulation

The following formulation gives the polymer and excipients quantities required for coating 10 kg of medium-sized tablets (diameter 7 mm, weight 140 mg) at a polymer weight of 5-6 mg/cm².

The necessary water quantity is filled into a 3 l vessel, and the polymer powder is added in portions with stirring. In doing so, it must be ensured that the powder is rapidly wetted and dispersed without lump formation. After stirring for 5 minutes, the ammonia solution is added dropwise at the periphery of the vortex within 5 to 10 minutes, preferably by means of a peristaltic pump, and stirring is continued for another 60 minutes.

Finally, the plasticizer triethyl citrate is added in the same way as the alkali solution, followed by stirring for one hour.
Partial neutralization with KOH is performed analogously. Poststirring for 8 to 10 hours, is required to distribute the potassium ions uniformly in the latex.

At the end of this period, a fine latexlike dispersion is obtained. This shows in the gradual disappearance of the particles initially present at the periphery of the suspension, giving way to formation of a milky-white, low-viscosity liquid.
This latex is then filtered through a 0.25 mm sieve. In the case of pronounced foam formation, 2 to 3 ml of antifoam emulsion are added.
The other excipients are homogenized in the remaining water by means of a high-speed mixer (Ultra-Turrax, toothed colloid mill) and stirred into the final dispersion. This spray suspension is then also passed through a 0.25 mm sieve and should be stirred throughout the coating process.

Typical formulation I
Enteric coating with
EUDRAGIT® S 100
(a) Dispersion with KOH

	Parts by weight)
EUDRAGIT® S 100	600 g
Triethyl citrate	300 g
1N KOH	306 g
Water	1,794 g
(b) Excipients	
Talc	200 g
TiO_2	47 g
Color lake	47 g
Water	2,706 g
å	**6,000 g**
Solids content:	20.2%
Content in dry polymer substance:	10.0%
Degree of neutralization	15 mole-%

Typical formulation II
Enteric coating with
EUDRAGIT® S 100
(a) Dispersion with NH_3

	Parts by weight
EUDRAGIT® S 100	692 g
Triethyl citrate	346 g
1N NH_3	353 g
Water	2070 g
(b) Excipients	
Talc	200 g
TiO_2	47 g
Color lake	47 g
Water	2,707 g
å	**6,462 g**
Solids content:	20.7%
Content in dry polymer substance:	10.7%
Degree of neutralization:	15 mole-%

This gives a polymer weight (578 g from 5,780 g spray suspension acc. formulation 2) of L = 4 mg/cm² by a tablets surface of S = 156.1 mm².

Operating data Example	**Enteric film coatings with EUDRAGIT® S 100 redispersed acc. to formulation I**	**Enteric film coatings with EUDRAGIT® S 100 redispersed acc. to formulation II**
Technical data		
Coating unit	Lödige Hi-Coater LHC 30	Lödige Hi-Coater LHC 60
Feed pump for suspension	Multifix “Supra"	Heraeus "Pericor"
Internal dia. of tube	4.0 mm	3.2 mm
Air spray gun	Schlick Model 970, flat sray	Lödige
Nozzle dia.	1.2 mm	0.7 mm
Distance nozzle/tablets	approx. 180 mm	approx. 80 mm
Product data		
Tablets	curved, ∅ 7 mm, h = 3.6 mm	curved, ∅ 7 mm, h = 3.6 mm
Weight	140 mg	140 mg
Hardness	50 - 60 N	50 - 60 N
Friability	0.2%	0.2%
Tablet quantity	13 kg	1.5 kg
Spray suspension	5,410 g corresp. to 1,119 g solids	900 g corresp. to 181.7 g solids
Process data		
Duration	190 min	140 min
Inlet air quantiy/temperature	5.2 m^3/min 50 - 53 °C	0,7 m^3/min 47 °C
Outlet air quantity/temperature	5.6 m^3/min 30 °C	30 –32 °C
Tablet temperature	approx. 30 °C	approx. 30 °C
Pan speed	12 rpm	16 - 17 rpm
Atomizing air pressure	1.5 bar	1.2 bar
Spray rate	3.29 g/min/kg product	4.88 g/min/kg product
Spraying time	170 min	123 min
Other process data		
Spraying process	continuous	continuous
Polymer weight	578 g corresp. to 4.0 mg/cm^2	90 g corresp. to 5.4 mg/cm^2
Drying/polishing	10 min at reduced pan speed, inlet air temperature 50 °C postdrying on trays for 2 hours in oven at 40 °C	
Results		
Appearance	uniform coating of subdued gloss	
Gastroresistance	for 2 hours (0.1 N HCl); no disintegration in buffer solution, pH values increasing stepwise to pH 6.8	
Disintegration in intestinal fluid pH 7.4 analogous to USP 23	57 - 63 min	33 – 50 min
Recommendations	see our sheets for scale-up instructions process technology	