

AQUPEC HV-701EDR

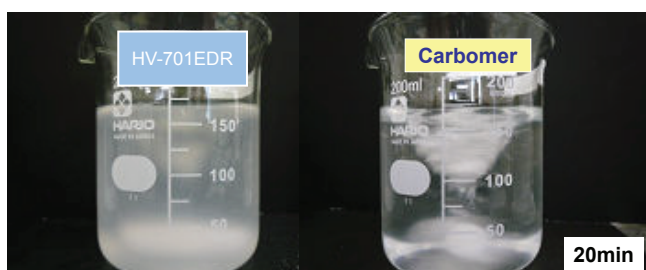
INCI Name: Acrylates/C10-30 Alkylacrylate Crosspolymer

Introduction

AQUPEC HV-701EDR is the traditional Sumitomo Seika product which has been specially designed to disperse easily. Additionally, AQUPEC HV-701EDR is produced in soft solvents (Class 2 of ICH guide, Benzene free).*

*ICH Guideline for Registration of Pharmaceuticals

Figure 1: Comparison between dispersion of HV-701EDR and Carbomer



As Figure 1 shows, dispersion of HV-701EDR is significantly much faster than that of carbomer. After 20 min stirring, HV-701EDR is fully dispersed while dispersion of carbomer needs some more time to be complete.

Chemical and physical characteristics:*

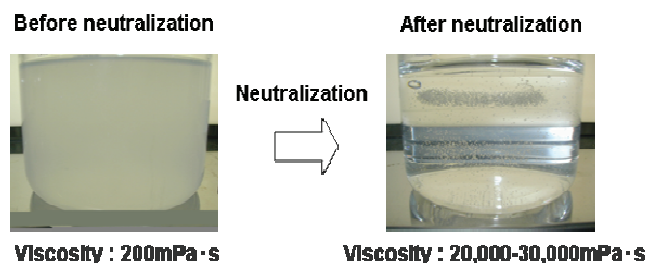
* not to be used as specification

Chemical	Acrylates/C10-30 Alkylacrylate
Name	Crosspolymer
CAS No.	Confidential
Chemical Structure	$\left[\text{CH}_2 - \underset{\text{COOH}}{\text{CH}} \right]_n \left[\text{CH}_2 - \underset{\text{COOR}}{\text{CR}'} \right]_m$ <p>R': H or CH₃ R: C10-30 alkyl</p>
INCI name	Acrylates/C10-30 Alkylacrylate

Appearance	White Powder
Bulk density	0.18-0.22g/ml
pH (0.5 % aqueous)^{a)}	Aprox 3
Solvent type	Class 2 (Benzene free)

a) Before neutralization

Figure 2: Neutralization of AQUPEC HV-701EDR



AQUPEC HV-701EDR is Acrylates/C10-30 Alkylacrylate Crosspolymer. AQUPEC HV-701EDR in water (before

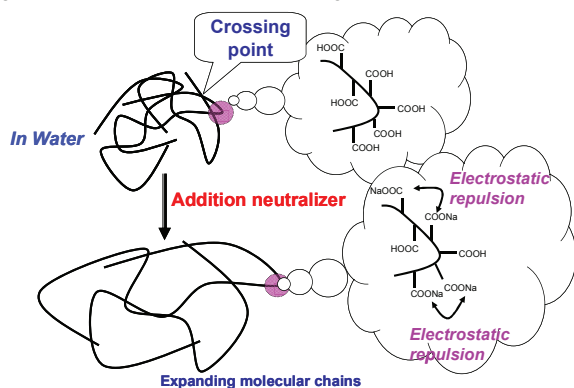
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neutralization) is an acid (pH approx 3) cloudy dispersion (Figure 2). In this state, AQUPEC's chains are tangled giving a low viscous medium. During neutralization, acid moieties of AQUPEC are neutralized. The resulting acrylate groups repulse each other expanding AQUPEC's chains (Figure 3). The result is a high viscous clear gel (Figure 2). On the other hand, as polymer chain contains some hydrophobic groups, good emulsion can be obtained. That fact makes the applicability of this polymer wider.

Figure 3: Mechanism of thickening of AQUPEC



Specifications

Table 1. Properties of AQUPEC HV-701EDR.

Item	HV-701EDR
1wt% mucilage ^{a)}	30,000 – 45,000 (pH7.0-7.8, Spindle #6)
1 wt% mucilage + 1.0 wt% salt ^{a)}	4,000 – 10,000 (pH7.0-7.8, Spindle #5)

a) Viscosity[mPa·s] (BH Type Viscometer, 20rpm).

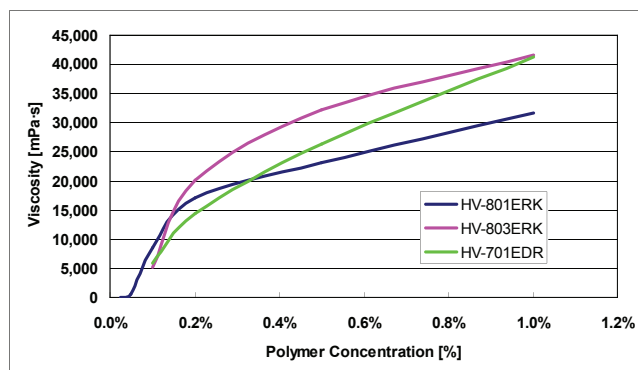
Key benefits:

- Easy dispersion.
- Benzene free.
- High viscosity at low concentration (Figure 4).

Features.

Basic Polymer Properties in Water.

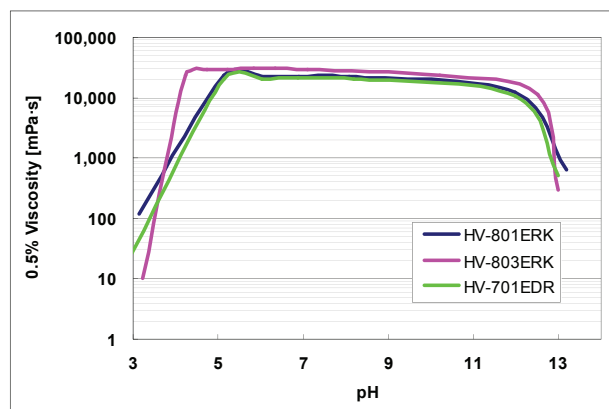
Figure 4: Viscosity vs concentration of AQUPEC HV-701EDR



1) Effect of pH.

Excellent thickening effect is achieved in the range of pH 5 to 11 (Figure 5). Out of this range, a decrease in viscosity occurs due to high ionic strength.

Fig 5: Viscosity vs pH.

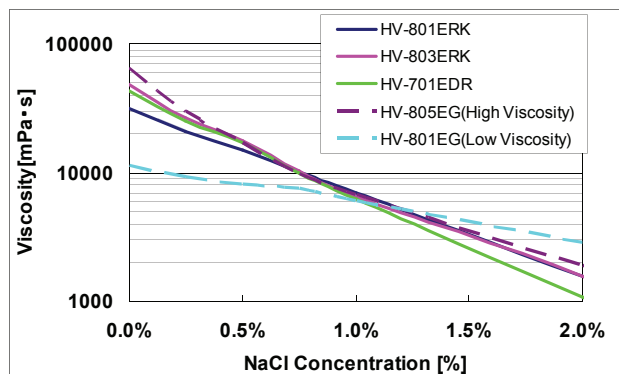


2) Effect of electrolytes

General speaking, anionic thickeners (such as AQUPEC) behavior in solution is significantly affected by the ionic strength. When electrolytes (such as sodium chloride) are present thickening capacity of AQUPEC lowers. The result is a decrease in viscosity of the aqueous solution (Figure 6).



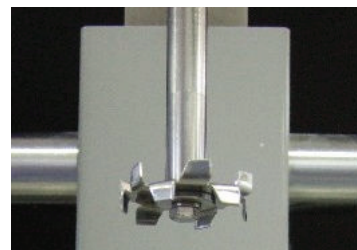
Figure 6: Viscosity vs NaCl concentration.



Note: pH of all solution is approx 7.

surfactant) may lead to the flocculation of AQUPEC.

Figure 7 Dispersion blade recommended for AQUPEC HV-701EDR



Storage & Handling

AQUPEC HV-701EDR is very hygroscopic and swells quickly in the presence of water. Keep the container closed when not in use, and store in a dry and dark area.

Packing

15 kg box

Shelf life

Two years from the date of the initial analysis (except for "loss on drying")

Recommendations for addition of HV-701EDR

- Add AQUPEC HV-701EDR gradually to water or mixtures which contain more than 80% water (With stirring). A common stirring blade can be used, but a dispersion blade (Figure 7) is recommended.
- Add AQUPEC HV-701EDR with stirring.
- After AQUPEC HV-701EDR is dispersed uniformly, the addition of the proper neutralizer will give a gel. Other ingredients can be added as well to complete the formulation.
- Before neutralization, the addition of some compounds which act as electrolytes (such as anionic

Viscosity Measurement Procedure

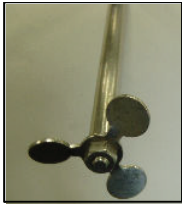
1. Using a graduated cylinder, measure 400 mL of distilled water (previously maintained at 25°C), and pour into a clean dry 1000-mL beaker.
2. Set up a variable speed laboratory stirrer with a propeller blade and adjust the speed to 1000 ± 50 rpm.
3. Weigh AQUPEC (5 g for a 1 % solution).
4. Add slowly the polymer with stirring (approx 1000 rpm).
When addition of polymer is finished, add 100 mL water in the beaker, and stir for 30 minutes.
5. Remove the propeller blade from beaker, and cover with watch glass or aluminum foil. Keep the solution in a water bath at 25 °C until foam breaks and there are not bubbles on the surface of the solution.
6. Place the "S" stirrer in the solution (Figure 8). Using a 10-mL graduated pipette quickly add the corresponding neutralizing agent.
7. Stir the gel formed at 220-250 rpm for one hour.
8. Check the pH of the gel with a pH meter. Values should be between 7.0-7.8. If solution is still acid, add some amount of NaOH solution 18 wt %. If it is too basic, discard it and prepare a new one.
9. For electrolyte resistance test: Add 5 g of NaCl (solution will be 1 wt % NaCl).
10. Check the temperature of the gel by placing a



thermometer straight down into the center of the gel. Do not stir or incorporate any air into the gel, as it must be as free of air as possible. Leave in water bath until temperature becomes between 24.5 and 25.5°C.

11. Measure the viscosity of the gel with VISMETRON at 20 rpm using suitable spindle.

Figure 8: Stirrers used in the preparation of AQUPEC gel



Propeller blade stirrer



"S" stirrer

Suggested Applications.

AQUPEC HV-701EDR can be used for a wide range of applications. For ex:

- Moisturizing Cream
- Shampoo

**Formulations:****Moisturizing cream**

Moisturizing Cream	
PART A	
Cetyl Alcohol	1.0 %
Caprylic/Capric Triglyceride	10.3 %
Isopropyl Myristate	4.0 %
PART B	
Water	74.3 %
Glycerin	5.0 %
AQUPEC HV-701EDR	0.2 %
Polysorbate 60	1.0 %
PART C	
6% NaOH	2.2 %
PART D	
Ethanol	6.0 %
	100.0 %

Procedure

- PART A: Mix PHASE A ingredients (bath at 75°C) .
- PART B: In a separated beaker, mix Glycerin and Polysorbate 60 in water. Add AQUPEC HV-701EDR to that solution and disperse keeping temperature at 75°C.
- Mix PART A and PART B (bath temperature = 75°C), with stirring.
- Keep stirring while add the corresponding amount of 6% NaOH aqueous solution (PHASE C).
- Cool mixture down (about 25°C).
- When batch temperature becomes about 25°C, add PART D and stir.

Shampoo.

Shampoo	
PART A	
AQUPEC HV-701EDR	0.2 %
Water	16.0 %
PART B	
Sodium Laureth Sulfate (3mon, 25%)	44.0 %
Potassium hydroxide (5%)	2.2 %
Water	9.5 %
PART C	
Sodium Benzoate	0.3 %
Disodium EDTA	0.1 %
Water	6.0 %
PART D	
Cocamidopropyl Betaine (30%)	21.3 %
PART E	
Ceric Acid	0.4 %
	100.0 %

Procedure

- PHASE A: Disperse AQUPEC HV-701EDR in water. Warm it up to 60°C.
- PHASE B: In a separated beaker, mix PHASE B ingredient.
- Add PHASE B to PHASE A. Mix it 5 minutes keeping temperature at 60°C.
- PHASE C: In a separated beaker, dissolve sodium benzoate and disodium EDTA in water.
- Add PHASE C to the mixture, and mix it 5 minutes at 60°C.
- Add PHASE E and mix it 5 minutes at 60°C.
- After cooling down below 40°C, add PHASE E and stir.

**Alcohol gel.**

Alcohol gel	
AQUPEC HV-701EDR	0.5 %
Ethanol	70.0 %
Water	29.0 %
Diisopropanolamine	0.5 %
	100.0 %

Procedure

1. Mix ethanol and water.
2. Disperse AQUPEC HV-701EDR, and stir it for about 5 hours.
3. Add diisopropanolamine and stir.