EASTMAN

Eastman AAEM

Preventing yellow color formation of acrylic latex

Eastman acetoacetoxyethyl methacrylate (AAEM) is a specialty monomer used in acrylic latex synthesis. The main advantages of AAEM-containing latex or latex film are:

- Improved block resistance, stain resistance, and water resistance via cross-linking
- Improved adhesion to metal substrate via chelating
- Improved formaldehyde (aldehyde) absorption functionality

Occasionally, AAEM-containing latex was reported to show yellow color, especially when a high dosage of AAEM (above 5% based on total monomer) was incorporated.

Our study found that the yellow color of AAEM-containing latex was mostly linked to factors of AAEM dosage, pH level, and iron content, as well as their interactions. See latex color examples in Figure 1 and factors interaction in Figure 2.

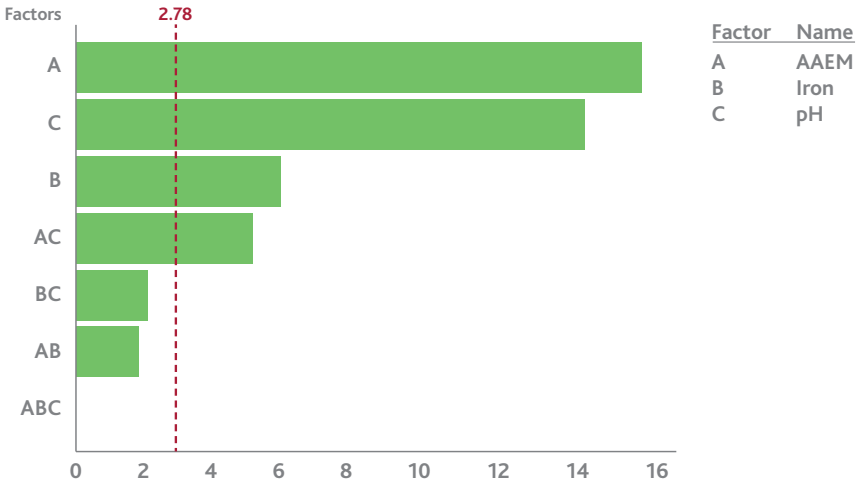
Figure 1. Example of yellowing of AAEM-containing latex

Sample 1: Latex containing 2% AAEM, 5 ppm iron content, and pH = 6

Sample 2: Latex containing 5% AAEM, 15 ppm iron content, and pH = 8

Sample 3: Latex containing 8% AAEM, 15 ppm iron content, and pH = 8

Figure 2. Pareto chart: Factors of AAEM latex yellowing



This was further validated by the fact that commercial latex was found to generally contain 3–10 ppm of iron, and this level of iron was enough to cause the yellow color of AAEM-containing latex.

Ethylenediaminetetraacetic acid (EDTA) was found to solve the yellowing issue of AAEM-containing latex.

The dosage of EDTA required will depend mainly on the iron content of the latex. As shown in Figure 3, adding 200 ppm and 50 ppm of EDTA can fully remove the yellow color in latex containing 15 ppm and 5 ppm of iron respectively.

Figure 3. Impact of EDTA and its level on color of AAEM latex

Sample 3: Latex containing 8% AAEM, 15 ppm of iron, and pH at 8.0

Sample 4: Latex containing 8% AAEM, 15 ppm of iron, pH at 8.0, and 200 ppm EDTA

Sample 5: Latex containing 8% AAEM, 5 ppm of iron, and pH at 8.0

Sample 6: Latex containing 8% AAEM, 5 ppm of iron, pH at 8.0, and 50 ppm EDTA

Results show that adding EDTA before latex neutralization reduces the yellow color of AAEM-containing latex.

Figure 4. Color of AAEM latex

Sample 4: Latex containing 8% AAEM, 15 ppm of iron, and pH at 8.0 with 200 ppm EDTA added before neutralization

Sample 7: Latex containing 8% AAEM, 15 ppm of iron, and pH at 8.0 with 200 ppm EDTA added after neutralization

Summary of suggestions to solve AAEM latex yellowing issue

- During the emulsion polymerization process, add EDTA to latex before neutralization. It is recommended to add EDTA in monomer emulsion.
- The level of EDTA required will vary depending on the iron content and AAEM dosage of latex. 50–200 ppm of EDTA is recommended for initial trial.

Note: *EDTA is difficult to dissolve in water at room temperature, but when the pH and/or temperature of the solution increases, the solubility of EDTA increases. It is recommended that a 1% EDTA aqueous solution at pH > 8.5 be made by adding sodium hydroxide solution.*

EASTMAN

The results of **insight**™

Eastman Chemical Company
Corporate Headquarters
P.O. Box 431
Kingsport, TN 37662-5280 U.S.A.

U.S.A. and Canada, 800-EASTMAN (800-327-8626)
Other Locations, +(1) 423-229-2000

www.eastman.com/locations

ADD-COAT-3782 1/17