is useful for the application of purposely producing polymers. To obtain PGAA, less pure AA from either the extraction/distillation or direct distillation procedure must be purified beyond that achieved by conventional fractional distillation because residual impurities, particularly the aldehydes, interfere with PGAA-related end use polymerization reactions. For these applications, aldehyde levels individually must be below about ten parts per million (ppm), more preferably below five ppm, and most preferably below one ppm. PGAA having these aldehyde levels is useful in producing, for example, superabsorbent polymers and polymers efficient as dispersants for oil well drilling muds and as flocculating agents.

One known method of producing PGAA applies aldehyde scavengers to dry AA in order to reduce aldehyde levels. Specifically, US 5,759,358 produces PGAA by sequentially applying, during the final stages of distillation, selected groups of amines to reduce acrolein and furfural.

It would be desirable to be able to reduce aldehyde content early in the manufacturing process. Benefits of early aldehyde removal include, but are not limited to, reduced costs associated with fouling-related column shut-down/clean-out and associated lost AA production.

SUMMARY

The disclosure is such a process for producing a pure grade (meth)acrylic acid, the process comprising contacting an aqueous crude (meth)acrylic acid, which comprises formaldehyde as an impurity, with at least 0.5 molar equivalent of cysteine per mole of formaldehyde impurity, wherein the contacting is conducted under conditions sufficient to reduce the concentration of the formformaldehyde impurity to less than 100 ppm per 100 weight parts (meth)acrylic acid.

In one aspect, there is provided a process for producing a pure grade (meth)acrylic acid, comprising contacting an aqueous crude (meth)acrylic acid, which comprises formaldehyde as an impurity, with at least 0.5 molar equivalent of cysteine per mole of formaldehyde impurity, wherein the contacting is conducted under conditions sufficient to reduce the concentration of the ~~form~~formaldehyde impurity to less than 100 ppm per 100 weight parts (meth)acrylic acid, and wherein the contacting is conducted in an absorber, quench tower, or dehydration column.

Surprisingly, the reaction of cysteine with aldehydes proceeds efficiently in the presence of aqueous organic acids such as acetic and (meth)acrylic acids.

WHAT IS CLAIMED IS:

1. A process for producing a pure grade (meth)acrylic acid, comprising contacting an aqueous crude (meth)acrylic acid, which comprises formaldehyde as an impurity, with at least 0.5 molar equivalent of cysteine per mole of formaldehyde impurity, wherein the contacting is conducted under conditions sufficient to reduce the concentration of the ~~form~~formaldehyde impurity to less than 100 ppm per 100 weight parts (meth)acrylic acid, and wherein the contacting is conducted in an absorber, quench tower, or dehydration column.

2. The process of Claim 1 wherein the amount of cysteine is at least 1 molar equivalent.

3. The process of any of the preceding claims wherein the amount of cysteine is from 1 to 10 molar equivalents.

4. The process of any of the preceding claims wherein the amount of cysteine is from 1 to 5 molar equivalents.

5. The process of any of the preceding claims wherein the amount of cysteine is from 1 to 2 molar equivalents.

6. The process of any of the preceding claims wherein the aqueous crude (meth)acrylic acid comprises at least 5 wt.% water.

7. The process of any of the preceding claims wherein the aqueous crude (meth)acrylic acid comprises from 5 to 80 wt.% water.

8. The process of any of the preceding claims wherein the concentration of the formaldehyde impurity is reduced to less than 50 ppm per 100 weight parts (meth)acrylic acid.

9. The process of any of the preceding claims wherein the concentration of the formaldehyde impurity is reduced to less than 25 ppm per 100 weight parts (meth)acrylic acid.

10. The process of any of the preceding claims wherein the concentration of the formaldehyde impurity is reduced to less than 10 ppm per 100 weight parts (meth)acrylic acid.

~~11. The process of any of the preceding claims wherein the contacting is conducted in an absorber, quench tower, or dehydration column.~~

~~12~~11. The process of any of the preceding claims wherein the process is continuous.

~~13~~12. The process of any of the preceding claims wherein the crude acid further comprises acrolein prior to the contacting with cysteine.