CLAIMS

What is claimed is:

1. A method for removing acetaldehyde from an acetic acid system, comprising:

   (a) obtaining from the acetic acid system a solution, comprising methyl iodide and a first concentration of acetaldehyde; and

   (b) contacting the solution with a polymer-bound polyol, wherein

   the polymer-bound polyol adsorbs a portion of the acetaldehyde to produce a treated solution,

   the treated solution has a second concentration of acetaldehyde, and

   the second concentration is lower than the first concentration.

2. The method of claim 1, wherein the polymer-bound diol is 2-hydroxymethyl-1,3-propanediol, glycerol, or a combination thereof.

3. The method of claim 1, wherein the polymer component of the polymer-bound polyol is selected from polystyrene crosslinked with divinylbenzene, polystyrene crosslinked with triphenylphosphine, or a combination thereof.

4. The method of claim 1, wherein the ratio of the second concentration to the first concentration is less than or equal to 0.75.

5. The method of claim 1, wherein the solution comprises less than 1 wt% water.

6. The method of claim 1, further comprising recycling the treated solution within the acetic acid system.

7. The method of claim 6, wherein the treated heavy organic stream is recycled to the acetic acid production reactor.

8. The method of claim 1, wherein contacting the solution with the polymer-bound polyol occurs at a temperature in the range of from 20°C to 135°C, for at least 10 minutes, and at a mass ratio of acetaldehyde to polymer-bound polyol is in a range of from 0.1 to about 2.0.

9. The method of claim 1, wherein contacting the solution with the polymer-bound polyol occurs at a mass ratio of acetaldehyde to polymer-bound polyol is in a range of from 0.1 to about 2.0.

10. The method of claim 1, wherein the acetic acid system comprises a decanter, the method further comprising:
    (a) removing a heavy organic phase stream comprising the solution from the decanter; and
    (b) passing the heavy organic phase stream to a flow-through bed;

    wherein the flow-through bed comprises the polymer-bound polyol, and wherein contacting the solution with the polymer-bound polyol is performed in the flow-through bed.

11. A method for producing acetic acid, said method comprising:
    (a) flashing a reaction mixture discharged from an acetic acid production reactor into a vapor stream and a liquid stream, the vapor stream comprising acetic acid, water, methanol, methyl acetate, methyl iodide, and acetaldehyde;
    (b) separating the vapor stream by distillation into: (1) a product side stream comprising acetic acid and water; (2) a bottoms stream; and (3) an overhead stream comprising methyl iodide, water, methyl acetate, acetic acid, and acetaldehyde;
    (c) condensing the overhead stream into: (1) a light aqueous phase comprising water, acetic acid, and methyl acetate; and (2) a heavy organic phase comprising methyl iodide, acetic acid, water, and a first concentration of acetaldehyde; and
    (d) contacting at least a portion of the heavy organic phase with a polymer-bound polyol to produce a treated heavy organic stream having a second concentration of acetaldehyde, wherein the second concentration is lower than the first concentration.

12. The method of claim 11, wherein the polymer component of the polymer-bound polyol is selected from polystyrene crosslinked with divinylbenzene, polystyrene crosslinked with triphenylphosphine, or a combination thereof.

13. The method of claim 11, further comprising recycling the treated solution within the acetic acid system.

14. An acetic acid production system comprising:
    (a) a reactor to react methanol and carbon monoxide in the presence of a carbonylation catalyst to form acetic acid;
    (b) a flash vessel that receives a reaction mixture comprising the acetic acid from the reactor;
    (c) a distillation column that receives a vapor stream from the flash vessel;
    (d) a decanter that receives a condensed overhead stream from the distillation column; and
    (e) a flow-through bed that receives a heavy organic phase from the decanter;

wherein:

the heavy organic phase comprises methyl iodide, and acetaldehyde; and

the flow-through bed comprises a polymer-bound polyol to adsorb acetaldehyde.