BRIEF SUMMARY

[0007] The present disclosure addresses this need by providing methods for obtaining gaseous 5-(halomethyl)furfural or purifying a 5-(halomethyl)furfural composition in a way that can decrease or minimize decomposition of the 5-(halomethyl)furfural. The 5-(halomethyl)furfural may be 5-(chloromethyl)furfural or 5-(bromomethyl)furfural.

[0007a] In one aspect of the present disclosure, there is provided a method comprising boiling a mixture comprising 5-(halomethyl)furfural and solvent to produce gaseous 5-(halomethyl)furfural, wherein the solvent has a boiling point at or above the boiling point of the 5-(halomethyl)furfural.

[0008] ~~In one aspect, provided~~Disclosed is a method that includes boiling a mixture having 5-(halomethyl)furfural and solvent to produce gaseous 5-(halomethyl)furfural. In some embodiments, the solvent may have a boiling point at or above the boiling point of the 5-(halomethyl)furfural. In certain embodiments where the 5-(halomethyl)furfural is 5-(chloromethyl)furfural, the solvent may have a boiling point of at least 240°C at standard pressure (*e.g.*, 1 atm).

[0008a] In another aspect, there is provided a method comprising contacting a mixture comprising 5-(halomethyl)furfural and solvent with a stripping agent to produce gaseous 5-(halomethyl)furfural, wherein the stripping agent has a vapor pressure above the vapor pressure of 5-(halomethyl)furfural.

[0009] ~~In other aspect, provided~~ Disclosed is a method that includes contacting 5-(halomethyl)furfural with a stripping agent to produce gaseous 5-(halomethyl)furfural, wherein the stripping agent has a vapor pressure above the vapor pressure of 5-(halomethyl)furfural. In some embodiments, provided is a method that includes contacting a mixture comprising 5-(halomethyl)furfural and solvent with a stripping agent to produce gaseous 5-(halomethyl)furfural, wherein the stripping agent has a vapor pressure above the vapor pressure of 5-(halomethyl)furfural.

[0010] In some embodiments of the methods above, the solvent includes one or more aromatic solvents, one or more heavy alkane solvents, one or more ester solvents, one or more silicone oils, or any combinations or mixtures thereof. In certain embodiments, the solvent includes one or more alkyl phenyl solvents. In one embodiment, the solvent includes sulfolane,

hexadecane, heptadecane, octadecane, icosane, heneicosane, docosane, tricosane, tetracosane, naphthalene, anthracene, tetramethylnaphthalene, or any combinations or mixtures thereof.

[0011] In some embodiments that may be combined with any of the foregoing embodiments, the method further includes collecting the gaseous 5-(halomethyl)furfural. In other embodiments that may be combined with any of the foregoing embodiments, the method further includes condensing the gaseous 5-(halomethyl)furfural to obtain purified 5-(halomethyl)furfural in liquid form. In yet other embodiments that may be combined with any of the foregoing embodiments, the method further includes depositing the gaseous 5-(halomethyl)furfural to obtain purified 5-(halomethyl)furfural in solid form.

[0011a] In a further aspect, there is provided a system comprising:

a purification apparatus;

5-(halomethyl)furfural; and

solvent, wherein the solvent has a boiling point at or above the boiling point of the 5-(halomethyl)furfural.

[0012] Provided herein is also a system that includes: a purification apparatus; 5-(halomethyl)furfural; and solvent having a boiling point at or above the boiling point of the 5-(halomethyl)furfural. In some embodiments of the system, the solvent in the system may include one or more aromatic solvents, one or more heavy alkane solvents, one or more ester solvents, one or more silicone oils, or any combinations or mixtures thereof. In certain embodiments, the solvent includes one or more alkyl phenyl solvents. In one embodiment, the solvent includes sulfolane, hexadecane, heptadecane, octadecane, icosane, heneicosane, docosane, tricosane, tetracosane, naphthalene, anthracene, tetramethylnaphthalene, or any combinations or mixtures thereof. The purification apparatus may be configured for continuous or batch processing.

DESCRIPTION OF THE FIGURES

[0013] The present application can be best understood by reference to the following description taken in conjunction with the accompanying figures, in which like parts may be referred to by like numerals.

[0014] FIG. **1** depicts an exemplary apparatus suitable for continuous processing with the methods provided herein.

[0015] FIG. **2** depicts an exemplary apparatus suitable for batch processing with the methods provided herein.

[0016] FIG. **3** depicts another exemplary apparatus for the methods provided herein.

DETAILED DESCRIPTION

[0017] The following description sets forth exemplary methods, parameters and the like. It should be recognized, however, that such description is not intended as a limitation on the scope of the present disclosure but is instead provided as a description of exemplary embodiments.

[0018] In one aspect, provided is a method for obtaining gaseous 5-(halomethyl)furfural or purifying a 5-(halomethyl)furfural composition by boiling a mixture having 5-(halomethyl)furfural and particular solvents. In some embodiments, the solvent may have a boiling point at or above the boiling point of the 5-(halomethyl)furfural. In certain embodiments where the 5-(halomethyl)furfural is 5-(chloromethyl)furfural, the solvent may have a boiling point of at least 240°C at standard pressure (*e.g.*, 1 atm). Examples of suitable solvents may include, for example, alkyl phenyl solvents (*e.g.*, linear alkyl benzenes), heavy alkane solvents,