Summary

In ~~one aspect~~the disclosure, there is provided a method for synthesizing an optionally substituted furoic acid, comprising:

converting a biomass to an optionally substituted furan via a dehydration reaction in the presence of an organic solvent;

purifying the optionally substituted furan by first partially or fully separating the organic solvent from the optionally substituted furan produced from said dehydration reaction, followed by extraction of the optionally substituted furan with water; and

oxidizing the extracted optionally substituted furan to form the optionally substituted furoic acid.

In one aspect, there is provided a method for synthesizing an optionally substituted furoic acid, comprising:

converting a biomass to an optionally substituted furan, wherein said furan is unsubstituted or substituted by at least one -C_1-C_{10}-alkyl-OH group, via a dehydration reaction in the presence of an organic solvent;

purifying the optionally substituted furan by first evaporating the organic solvent from the optionally substituted furan produced from said dehydration reaction to obtain a solid residue or an aqueous slurry, followed by adding water to the residue or aqueous slurry for extraction of the optionally substituted furan with water, collecting the supernatant separately from the residue; and

oxidizing the extracted optionally substituted furan to form the optionally substituted furoic acid.

The biomass may comprise a carbohydrate selected from cellulose, fructose, glucose or any other sugar. An

example of such a biomass may be Jerusalem artichoke (JAT).

The organic solvent used for the dehydration reaction may be partially or fully separated by evaporation. This may enhance extraction of the optionally substituted furan or reduce the amount of water extraction needed to be able to fully extract the optionally substituted furan.

When the organic solvent is partially or fully evaporated, a solid residue or an aqueous slurry comprising the optionally substituted furan and the impurities may be obtained. These impurities may include any compounds that may exist after dehydration of the biomass. Examples may include humins and other polymers.

The water extraction may be repeated several times and the extracts containing the optionally substituted furan may be combined. By repeating the water extraction, the extraction yield of the optionally substituted furan,

(Au/HT), gold-palladium/hydrotalcite (Au_8Pd_2/HT) or platinum/carbon (Pt/C).

For optimum oxidation, catalytic oxidation may be first carried out for about 1 to 3 hours at about 30 to 70°C. The oxidation may then continue at a higher temperature of 80 to 110°C for an additional 4 to 10 hours. This may help to aid complete oxidation. For instance, when HMF is the optionally substituted furan that is oxidized, some of it may be converted to HFCA. By increasing oxidation temperature and reaction time, this HFCA may be eventually converted to the desired FDCA so as to improve overall conversion yield.

In ~~another aspect~~the disclosure, there is provided an aqueous solution of 5-(hydroxymethyl)furfural obtainable by:

converting a biomass to an optionally substituted furan via a dehydration reaction in the presence of an organic solvent;

purifying the optionally substituted furan by first partially or fully separating the organic solvent from the optionally substituted furan produced from said dehydration reaction, followed by extraction of the optionally substituted furan with water.

In another aspect, there is provided an aqueous solution of 5-(hydroxymethyl)furfural obtained by:

converting a biomass to an optionally substituted furan, wherein said furan is unsubstituted or substituted by at least one -C_1-C_{10}-alkyl-OH group, via a dehydration reaction in the presence of an organic solvent;

purifying the optionally substituted furan by evaporating the organic solvent from the optionally substituted furan produced from said dehydration reaction to obtain a solid residue or an aqueous slurry, followed by adding water to the residue or aqueous slurry for

extraction of the optionally substituted furan with water and collecting the supernatant separately from the residue.

As mentioned above, the organic solvent may be partially or fully separated by evaporation so as to obtain a solid residue or an aqueous slurry comprising the optionally substituted furan and/or the impurities found in the biomass.

Water may then be added to extract the optionally substituted furan, particularly the HMF. This water extraction may be repeated several times and the extracts containing the optionally substituted furan may be combined.

In another aspect, there is provided the use of the aqueous solution as defined above to convert 5-