

The Chemistry And Technology Of Furfural And Its

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this book is a world first since the furfural industry has been traditionally secretive to the point of appearing shrouded in clouds of mystery even renowned encyclopedic works have published but scant and often erroneous information on the subject striking a healthy balance between theory and practice the book leads the reader from reaction mechanisms and kinetics to the technology of making furfural by various old and new processes using conventional raw materials or sulfite waste liquor detailed discussions of means of increasing the yield are of great chemical and technological interest as well as of immense economic importance from furfural proper

the treatise shifts to the fascinating field of wanted and unwanted by products ranging from largely unutilized carboxylic acids to troublesome impurities such as 5 methyl furfural and 2 furyl methyl ketone and then to extremely valuable serendipitous flavor compounds such as diacetyl and 2,3-pentanedione a wide variety of derivatives are discussed considerable space is devoted to polytetrahydrofuran an important building block of stretchable synthetic fibers while furan resins from both furfural and furfuryl alcohol are given the attention commensurate with their industrial importance notable supplementary chapters cover the in line measurement of furfural the treatment of furfural waste water and various aspects of corrosion a chapter on the applications of furfural elaborates not only traditional uses in extracting petroleum and vegetable oils but also the sensational discovery that furfural is a highly effective indirect nematocide without becoming toxic it changes the microflora of the soil by stimulating bacteria antagonistic to nematodes thereby reducing the nematode population to zero at an unprecedented low price it is believed that this application will be the principal outlet for furfural in the future a comprehensive list of physical properties some never published before make the book an indispensable companion for producers users and researchers alike

the sugar dehydration products furfural and 5-hydroxymethyl furfural (HMF) are commonly formed during high temperature processing of lignocellulose most often in thermochemical pretreatment liquefaction or pyrolysis typically these two aldehydes are considered major inhibitors in microbial conversion processes many microbes can convert these compounds to their less toxic dead end alcohol counterparts furfuryl alcohol and 5-hydroxymethyl furfuryl alcohol recently the genes responsible for aerobic catabolism of furfural and HMF were discovered in *Cupriavidus basilensis* HMF14 to enable complete conversion of these compounds to the TCA cycle intermediate 2-oxoglutarate in this work we engineer the robust soil microbe *Pseudomonas putida* KT2440 to utilize furfural and HMF as sole carbon and energy sources via complete genomic integration of the 12 kb HMF gene cluster previously reported from *Burkholderia phytofirmans* the common intermediate 2-furoic acid is shown to be a bottleneck for both furfural and HMF metabolism when cultured on biomass hydrolysate containing representative amounts of furfural and HMF from dilute acid pretreatment the engineered strain outperforms the wild type microbe in terms of reduced lag time and enhanced growth rates due to catabolism of furfural and HMF overall this study demonstrates that an approach for biological conversion of furfural and HMF relative to the typical production of dead end alcohols enables both enhanced carbon conversion and substantially improves tolerance to hydrolysate inhibitors furthermore this approach should find general utility both in emerging aerobic processes for the production of fuels and chemicals from biomass derived sugars and in the biological conversion of high temperature biomass streams from liquefaction or pyrolysis where furfural and HMF are much more abundant than in biomass hydrolysates from pretreatment

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