Extraction of 5-HMF using mixed solvents from simulated hydrothermal conversion product

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Mixed solvent liquid-liquid extraction was employed to extract 5-HMF from simulated hydrothermal conversion (HTC) product, which was composed of 5-HMF with levulinic acid and furfural as two major co-products. Three groups of mixed solvents were applied, including DCM-THF, DCM-2-butanol and 2-butanol-THF mixed solvents with different mixing ratios. 20wt% and 10wt% NaCl were added in to facilitate phase separation and to improve the extraction performance. It was found that mixed solvents studied were more effective for 5-HMF extraction from simulated HTC product than some single solvents. Using 20wt% NaCl significantly improved 5-HMF extraction. 2-butanol-THF mixed solvent exhibited the promising performance for 5-HMF extraction, in which entry 7 (V2-butanol: VTHF= 1:4) is most favorable. and the corresponding partition coefficient reached as high as 6.87. pH condition affected extraction of levulinic acid more greatly than that of 5-HMF and furfural. pH 2.4 was more favorable for 5-HMF extraction than pH 2.0. Extraction capacity of DCM-THF and THF-2-butanol mixed solvent was independent to solvent volume fraction. Around 90% organic solvent recovery rates made this method economically feasible. The limitation of this method is that purification of 5-HMF was not achieved, because furfural was much easier to be extracted into organic phase than 5-HMF. Further study of its application in real HTC production is needed.