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SYNTHESIS OF FURFURAL FROM PRE-BALL-MILLED SUNFLOWER HUSKS

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Abstract. Furfural (FF) is an essential natural building block for the synthesis of non-petroleum-derived chemicals and solvents, including furan and tetrahydrofuran (THF), providing an alternative to petrochemical production of these compounds based on biomass by 1,4-butanediol dehydration[1]. 5-Hydroxymethylfurfural (5-HMF) as a by-product of xylose dehydrogenation in the production of furfural and its substituted derivatives, on the one hand, are precursors for the production of liquid alkanes (C7 - C15), which serve as diesel fuel components, on the other hand, are important components and pharmacologically active compounds associated with a wide range of biological activity[2,3]. Quantum chemical calculations, namely, the calculation of energy barriers for xylose dehydrogenation, made it possible to present the most probable mechanism[4] from a significant list of alternatively presented in the literature (Fig.1).

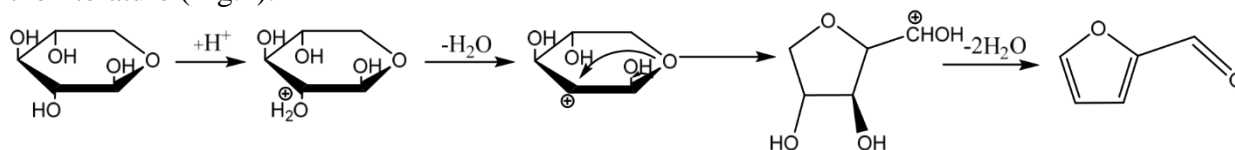


Figure 1. The most likely mechanism for acid hydrolysis of polysaccharides, resulting in furfural.

All pentosans containing fibrous material can theoretically be used as raw materials for the production of furfural. However, the industrial production of furfural requires a pentosan content of at least 18-20% [5]. Sunflower husk is among the top ten agricultural residues containing about 25% pentosans and is a convenient model for the development of synthesis methods due to the composition typical of straw and wood waste[6]. The industrial yield of furfural from the husks of sunflower consists of only 8-9%.

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