TiO_2/Chitosan-Lignin Photocatalyst for the Selective Oxidation of 5-Hydroxymethyl-2-Furaldehyde

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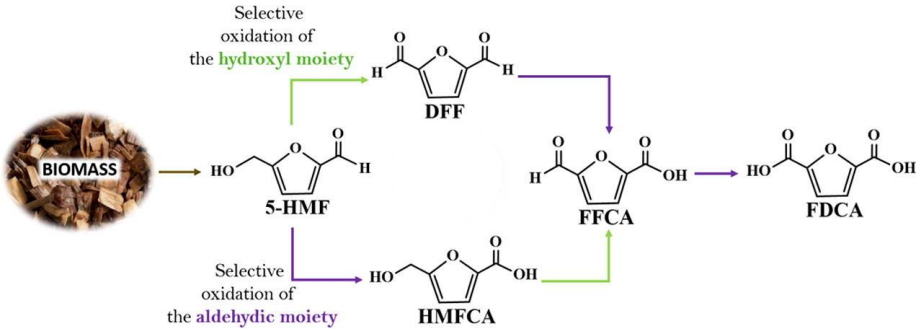
Biomass resource utilization for the production of valuable chemicals is vital for sustainable chemical industries. 5- hydroxymethyl-2-furaldehyde (HMF), derived from the dehydration of cellulosic biomass is considered to be a platform chemical for the production of value-added products [1]. HMF can be selectively oxidized to 2,5-furandicarbaldehyde (DFF) that has been identified as a building block for biopolymers and precursor for pharmaceuticals (Fig. 1) [2]. Herein we report the synthesis of TiO_2/Chitosan-Lignin photocatalyst via wet impregnation method with subsequent hydrothermal treatment at 150 ^{O}C for 8 hours. It is interesting to prepare a photocatalyst utilizing lignin and chitosan which is a potential waste of paper industry and sea food industry, respectively. Additionally, the presence of mutiple functional groups in lignin and chitosan make them potential candidates for photocatalyst support [3,4]. The prepared photocatalyst was characterized by IR, XPS, XRD, TGA, FTIR and SEM analysis. The characterization of TiO_2/Chitosan-Lignin photocatalyst revealed the presence of multiple functional groups over the surface and showed the presence of Anatase phase of titania. Moreover, the prepared TiO_2/Chitosan-Lignin photocatalyst was active under UV (375nm) and visible light (515nm) for the selective oxidation of HMF (to DFF) in acetonitrile.



5-HMF (5-Hydroxymethyl-2-furaldehyde), **DFF** (2,5-furandicarbaldehyde), **HMFCA** (5-Hydroxymethyl-2-furoic acid), FFCA (5-Formyl-2-furoic acid) **FDCA** (furan-2,5-dicarboxylic acid)

Fig. 1 Plausible HMF oxidation pathway [5].

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