World Academy of Science, Engineering and Technology
International Journal of Industrial and Manufacturing Engineering
Vol:9, No:03, 2015

Polymer Impregnated Sulfonated Carbon Composite as a Solid Acid Catalyst for the Dehydration of Xylose to Furfural

Authors : Praveen K. Khatri, Neha Karanwal, Savita Kaul and Suman L. Jain

Abstract : Conversion of biomass through green chemical routes is of great industrial importance as biomass is considered to be most widely available inexpensive renewable resource that can be used as a raw material for the production of bio fuel and value-added organic products. In this regard, acid catalyzed dehydration of biomass derived pentose sugar (mainly D-xylose) to furfural is a process of tremendous research interest in current scenario due to the wider industrial applications of furfural. Furfural is an excellent organic solvent for refinement of lubricants and separation of butadiene from butene mixture in synthetic rubber fabrication. In addition it also serve as a promising solvent for many organic materials, such as resins, polymers and also used as a building block for synthesis of various valuable chemicals such as furfuryl alcohol, furan, pharmaceutical, agrochemicals and THF. Here in a sulfonated polymer impregnated carbon composite solid acid catalyst (P-C-SO3H) was prepared by the pyrolysis of a polymer matrix impregnated with glucose followed by its sulfonation and used for the dehydration of xylose to furfural. The developed catalyst exhibited excellent activity and provided almost quantitative conversion of xylose with the selective synthesis of furfural. The higher catalytic activity of P-C-SO3H may be due to the more even distribution of polycyclic aromatic hydrocarbons generated from incomplete carbonization of glucose along the polymer matrix network, leading to more available sites for sulfonation which resulted in greater sulfonic acid density in P-C-SO3H as compared to sulfonated carbon catalyst (C-SO3H). In conclusion, we have demonstrated sulfonated polymer impregnated carbon composite (P-C-SO3H) as an efficient and selective solid acid catalyst for the dehydration of xylose to furfural. After completion of the reaction, the catalyst was easily recovered and reused for several runs without noticeable loss in its activity and selectivity.

Keywords : Solid acid , Biomass conversion, Xylose Dehydration, Heterogeneous catalyst
Conference Title : ICRIET 2015 : International Conference on Research and Innovations in Engineering and Technology
Conference Location : Miami, United States
Conference Dates : March 09-10, 2015