National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Return seminar -UTILIZING LIGNOCELLULOSIC WASTE FOR EXTRACTION AND CHARACTERIZATION OF CELLULOSE AND NANOCELLULOSE
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Venue	: CH 306
Date and Time	: 26 Sep 2024 (5.15 pm)
Abstract	: Background: The lignocellulosic wastes can be utilized for extraction of cellulose and nanocellulose which not only reduces environmental stress but also adds to economic growth. Nanocellulose possesses excellent barrier properties, mechanical strength, crystallinity, and thermal stability, making it a perfect material for a wide range of applications. Being an efficient and rapid process, acid hydrolysis was used for the extraction of nanocellulose. Methods: In this work, jackfruit peel was used for the extraction of cellulose and further its conversion to nanocellulose using acid hydrolysis process. Jackfruit peel was treated with alkali and bleaching agents to remove the non-cellulosic materials and isolate pure cellulose. Further, different inorganic acids (sulphuric acid, hydrochloric acid, and phosphoric acid) and organic acids (formic acid, citric acid, oxalic acid) of 6M concentration were used for acid hydrolysis to obtain nanocellulose at 80°C for 3 h. The impact of different organic and inorganic acids was evaluated based on particle size, zeta potential, crystallinity, microstructure, and thermal stability. Results: The yield of cellulose from jackfruit peel was 25.6% with a purity of 86.03%. Acid hydrolysis using inorganic acids yielded nanocellulose with average particle size of 100 - 160 nm, whereas it was 170 - 250 nm for organic acid hydrolysed nanocellulose. The FTIR spectra of cellulose and nanocellulose powder confirmed the removal of lignin and hemicellulose and confirmed that the absorption bands of cellulose remained intact in the case of nanocellulose. The crystallinity of nanocellulose and cellulose was higher than the jackfruit peel powder. TEM and FESEM images confirmed the reduction in size of obtained nanocellulose. Conclusions: This study emphasized the importance of acid strength in controlling the dissociation of hydrogen bonds and affecting the properties of nanocellulose obtained. The obtained nanocellulose with excellent properties can be utilized in various food applications. Keywords: Jackfruit peel, Nanocellulose, Acid hydrolysis