Simultaneous Removal of Organic Matter and Production of Bacterial Cellulose from Wastewater Using Rotating Disk Reacto

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ABSTRACT

Bacterial cellulose membrane, an exopolysaccharide production by some bacterial, has unique physical and chemical properties, including well-developed surface area, high mechanical strength and ultrafine 3D network structure. In this study, the factors for bacterial cellulose production by Gluconacetobacter sp. Wu1-1 in Rotating Disks Reactor (RDR) were investigated. In the preliminary study, discs made from polycarbonate fabricated with 400C of sandpaper gave the highest result compared to others. The optimal number of disk and rotation speed for bacterial cellulose production were found to be 8 and 8 rpm. The bacterial cellulose production and COD removal rate were 0.99 g/L and 67.7%, respectively, in aeration treatment of high COD wastewater at hydraulic retention times (HRT) of 16 h. On the other hand, application of bacterial cellulose in wastewater treatment, the main focus of copper sorption from aqueous solution by bacterial cellulose was conducted in batch condition. Kinetic data and equilibrium sorption isotherms were measured. Results indicated that the sorption process follow a pseudo second-order kinetics and the Langmuir model gave a better fit to the experimental data. Additionally, the thermodynamic parameters (ΔG, ΔH?, ΔS?) for the adsorption process were calculated and results suggest that the nature of adsorption is endothermic and the process is spontaneous and favorable. On the other hand, the membrane pressure was enhanced as the thickness increased, and the thin membrane has better permeability. However, the adsorption of copper was reduced when the membranes were pressed by Manual Forming Machine. In additionally, the modified/unmodified of bacterial cellulose were characterized by Fourier Transfer Infrared spectroscopy (FTIR) and Scanning electron microscope (SEM).

Keywords : Bacterial cellulose membrane、Gluconacetobacter sp. Wu1-1、rotating disks reactor、chemical modification 、membrane pressure

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