Bacterial cellulose membrane, an exopolysaccharide production by some bacteria, 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 Disk 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 discs and rotation speed for bacterial cellulose production were found to be 8 and 8 rpm, respectively. 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, the 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 follows 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 addition, the modified/unmodified of bacterial cellulose were characterized by Fourier Transform Infrared spectroscopy (FTIR) and Scanning electron microscope (SEM).
and feed flow rates on tolerance of BC by drying at 80℃.

Figure 4-48 The photograph of different treatment and thickness for BC wet membrane.

Figure 4-47 Effect of different membrane thicknesses and feed flow rates on tolerance of BC.

Figure 4-46 The photograph of different treatment and thickness for BC wet membrane.

Figure 4-45 Effect of different membrane thicknesses and feed flow rates on tolerance of BC.

Figure 4-44 Desorption copper from BC powders.

Figure 4-43 Zeta potentials of the BC membrane at different solution pH values.

Figure 4-42 Kinetics of copper adsorption onto BC powder base on various concentration of copper.

Figure 4-41 Kinetics of copper adsorption onto BC powder base on various pH conditions.

Figure 4-40 Kinetics of copper adsorption onto BC powder base on various amount of BC powder.

Figure 4-39 Adsorption isotherm of copper onto BC powder at 25℃.

Figure 4-38 Kinetics of copper adsorption onto BC powder base on various concentration of copper.

Figure 4-37 Effect of temperature on the adsorption of copper by BC powders.

Figure 4-36 Effect of temperature on the adsorption of copper by BC powders.

Figure 4-35 Effect of different copper concentration on the adsorption of copper.

Figure 4-34 The effect of different homogeneous treatment on BC for the adsorption of copper.

Figure 4-33 Effect of different pressure treatment by Manual Forming Machine on BC for the adsorption of copper.

Figure 4-32 The effect of different pressure treatment by Manual Forming Machine on BC for the adsorption of copper.

Figure 4-31 The effect of different pressure treatment by Manual Forming Machine on BC for the adsorption of copper.

Figure 4-30 Effect of HRT on removal of COD and dried weight of BC by Gluconacetobacter sp. Wu1-1 in RDR.

Figure 4-29 The time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at different HRT in RDR.

Figure 4-28 Effect of distance of disk on removal of COD and dried weight of BC by Gluconacetobacter sp. Wu1-1 in RDR.

Figure 4-27 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various distance of disk in RDR.

Figure 4-26 The image of BC production in the RDR by Gluconacetobacter sp. Wu1-1 at different rotation speed in RDR.

Figure 4-25 Effect of rotation speed on removal of COD and dried weight of BC by Gluconacetobacter sp. Wu1-1 in RDR.

Figure 4-24 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various rotation speed in RDR.

Figure 4-23 Schematic model of Gluconacetobacter sp. Wu1-1 attached to different disk roughness in RDR.

Figure 4-22 Effect of disk roughness on removal of COD and dried weight of BC by Gluconacetobacter sp. Wu1-1.

Figure 4-21 The effect of different pressure treatment by Manual Forming Machine on BC for the adsorption of copper.

Figure 4-20 The image of BC production in the flask by Gluconacetobacter sp. Wu1-1 at various copper concentration in flask.

Figure 4-19 Effect of adding various NH4+-N concentration at 48 hour for removal of COD, dried weight and thickness of BC by Gluconacetobacter sp. Wu1-1.

Figure 4-18 Effect of adding various NH4+-N concentration on removal of COD, dried weight and thickness of BC by Gluconacetobacter sp. Wu1-1.

Figure 4-17 Effect of NH4+-N concentration on removal of COD, dried weight and thickness of BC by Gluconacetobacter sp. Wu1-1.

Figure 4-16 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various NH4+-N concentration.

Figure 4-15 Effect of YE concentration on removal of COD, dried weight and thickness of BC by Gluconacetobacter sp. Wu1-1.

Figure 4-14 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various nitrogen source.

Figure 4-13 The photograph of BC production by Gluconacetobacter sp. Wu1-1 at various nitrogen source (2 g/L) after 4 days.

Figure 4-12 Effect of various nitrogen source on removal of COD, dried weight and thickness of BC by Gluconacetobacter sp. Wu1-1.

Figure 4-11 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various nitrogen source.

Figure 4-10 The photograph of BC production by Gluconacetobacter sp. Wu1-1 after 4 days.

Figure 4-9 Effect of various COD concentration in SWW II on removal of COD by Gluconacetobacter sp. Wu3M.

Figure 4-8 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various COD concentration in SWW II.

Figure 4-7 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various COD concentration in SWW I.

Figure 4-6 Comparison of RDR and RBC system.

Figure 4-5 Schematic diagram of permeability system.

Figure 4-4 Effect of pH values in SWW II on removal of COD, dried weight and thickness of BC by Gluconacetobacter sp. Wu2-1 at various simulated wastewater.

Figure 4-3 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various simulated wastewater.

Figure 4-2 Time course of cell growth and removal of COD by Gluconacetobacter sp. Wu1-1 at various simulated wastewater.

Figure 4-1 Chemical Structure of Cellulose (Image created on ChemDraw®).

Figure 3-6 The calibration curve of copper ion.

Figure 3-5 Schematic diagram of permeability system.

Figure 3-4 Schematic diagram of filter system.

Figure 3-3 The photograph of BC production by Gluconacetobacter sp. Wu1-1.

Figure 3-2 RDR in this study.

Figure 3-1 Schematic diagram of RDR.

Figure 2-2 Formation of dimensional network in bacterial cellulose.

Figure 2-1 Chemical Structure of Cellulose.
Cd, Cu and Zn from wastewater by treated Azolla filiculoides with H2O2/MgCl2. International Journal of Environmental Science and
2003. The fabrication and evaluation of the formulation variable of a controlled-porosity osmotic drug delivery system. Pharmaceutical


Moon, S. 36: 2304-2318.


