Preparation and Characterization ofChitosan / Bacterial Cellulose Composites

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ABSTRACT

This research used the acetobacter culture broth of weak acidity with added chitosan to cultivate the chitosan/bacterial cellulose membrane. First of all, the effect of fermentation conditions for the production of bacterial membrane was investigated. Fermentation conditions were discriminated direct culture from pre-culture by the time of adding chitosan. The effect fermentation conditions as well as the effect of adding 3000 kDa and 1820 kDa chitosan respectively on the production of bacterial cellulose were discussed. The preliminary experiment results show that the pH valve of the direct culture broth with added chitosan was increased from 3.88 to 4.9 immediately and held during the fermentation. On the other hand the pH valve of the culture broth without added chitosan was decreased from 3.88 to 2.3. The acid concentration of the culture broths were studied by a titration. A distinguishing acid concentration change was found for the broths without added chitosan. For the pre-culture condition, the acid concentrations of the broths with added chitosan were increased gradually. From the preliminary results of pH studies, acid concentration change, and membrane production, it is concluded that a pre-culture fermentation conditions are more suitable for production chitosan/ bacterial cellulose membrane. Secondly, the effect of adding different molecular weight of chitosan on the production chitosan/ bacterial cellulose membrane was investigated. FTIR results confirmed that chitosan was found in the bacterial cellulose membrane according some functional groups shown in the spectra. FTIR also confirmed membrane with low molecular weight chitosan was more hygroscopic. The results of FESEM show that chitosan would complex with bacterial cellulose. The higher molecular weight of chitosan the stronger interaction of both molecules was found. The lower molecular weight of chitosan the looser interaction of molecules structure was found. The elemental analysis results show the N, C, H, and O contents of each sample. From the calculation of N element found in sample, it can figure out the chitosan content in sample. From the antibacterial halo zone test, it was observed that a halo zone has appeared around the complex membrane. It confirmed that chitosan is non-diffusible antibacterial agent. We conclude that the chitosan/ bacterial cellulose complex membrane with stronger and denser structures could be produced abundantly by adding 3,000 kDa and 1,800 kDa chitosan.

Keywords : Acetobacter、Bacterial cellulose、Chitosan

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