KEMUDAHAN BIODEGRADASI SELULOSA BAKTERI DARI LIMBAH CAIR UBI JALAR DENGAN PENAMBAHAN GLISEROL & KITOSAN TERDEPOSIT NANOPARTIKEL PERAK

Oleh:
Nurul Widiastuti
11307141016

Pembimbing Skripsi: Dr. Eli Rohaeti

ABSTRAK

Penelitian ini bertujuan untuk mengetahui: 1) terbentuknya nanopartikel perak yang dipreparasi dengan reduktor trisodium sitrat dan penstabil gelatin, 2) pengaruh penambahan gliserol dan kitosan terhadap kemudahan biodegradasi selulosa bakteri dari limbah cair ubi jalar yang terdeposit nanopartikel perak, 3) pengaruh lama biodegradasi terhadap kemudahan biodegradasi selulosa bakteri yang terdeposit nanopartikel perak, dan 4) gugus fungsi dan kristalinitas selulosa bakteri terdeposit nanopartikel perak yang paling mudah terbiodegradasi.

Penelitian diawali dengan membuat nata dari limbah cair ubi jalar yang difermentasi dengan *Acetobacter xylinum* selama 7 hari. Selulosa bakteri-gliserol saat preparasi ditambahkan 0,5 mL gliserol sedangkan selulosa bakteri-kitosan dan selulosa bakteri-gliserol-kitosan sebelum proses pengeringan direndam dalam larutan kitosan 2%. Preparasi nanopartikel perak dilakukan dengan metode reduksi larutan $AgNO_3$ $1x10^{-3}$ M dengan reduktor trisodium sitrat dan penstabil gelatin serta dikarakterisasi menggunakan spektrofotometer UV-Vis. Kemudahan biodegradasi selulosa bakteri dan kompositnya melalui penentuan kehilangan massa dan laju kehilangan massa. Selulosa bakteri yang paling mudah terbiodegradasi dikarakterisasi dengan FTIR-ATR untuk menganalisis gugus fungsi dan XRD untuk menganalisis kristalinitas.

Hasil penelitian menunjukkan bahwa: 1) preparasi nanopartikel perak telah berhasil dilakukan diperkuat adanya serapan pada panjang gelombang 418,80 nm, 2) penambahan gliserol dan kitosan menurunkan kemudahan biodegradasi selulosa bakteri dari limbah cair ubi jalar, 3) semakin lama waktu biodegradasi menyebabkan peningkatan kehilangan massa dan penurunan laju kehilangan massa, dan 4) selulosa bakteri terdeposit nanopartikel perak yang paling mudah terbiodegradasi memiliki gugus –OH dan C-O alkohol serta mengalami peningkatan kristalinitas sesudah mengalami proses biodegradasi.

Kata kunci: *selulosa bakteri dan kompositnya, nanopartikel perak, kemudahan biodegradasi, gugus fungsi, dan kristalinitas*

BIODEGRADABILITY OF BACTERIAL CELLULOSE FROM LIQUID WASTE OF SWEET POTATOES WITH ADDITION GLYCEROL & CHITOSAN DEPOSITED BY SILVER NANOPARTICLE

By:
Nurul Widiastuti
11307141016

Supervisor: Dr. Eli Rohaeti

ABSTRACT

This research aimed to determine: 1) the formation of silver nanoparticles prepared by trisodium citrate as reductor and gelatin stabilizer, 2) the effect of adding glycerol and chitosan on biodegradability of bacterial cellulose sweet potato waste water deposited by silver nanoparticles, 3) the effect of biodegradation time to biodegradatibility of bacterial cellulose deposited silver nanoparticles, and 4) functional groups and crystallinity of bacterial cellulose deposited silver nanoparticles most easily biodegradable.

The research was started by making nata of liquid waste of sweet potatoes which is fermented by *Acetobacter xylinum* during 7 days. Bacterial cellulose-glycerol mixture was prepared by adding 0.5 mL glycerol. Bacterial cellulose-chitosan and bacterial cellulose-glycerol-chitosan were prepared before the drying process by immersed in chitosan 2% solution. Preparation of silver nanoparticles was carried out by chemical reduction method from solution of $AgNO_3$ $1x10^{-3}$ M with trisodium citrate as reductor and stabilizer gelatin and than was characterized by using UV - Vis spectrophotometer. Biodegadability of bacterial cellulose and its composite was studied by mass loss and rate of mass loss. The cellulose was characterized by FTIR-ATR to determine the functional groups and XRD to determine crystallinity.

The results showed that : 1) the silver nanoparticles have been successfully syntetized indicated by absorption at 418.80 nm, 2) the addition of glycerol and chitosan decreased biodegradability of bacterial cellulose, 3) the longer the biodegradation time caused in deposited increasing mass loss and decreasing the rate of mass loss, and 4) the highest nanosilver doped bacterial cellulose had -OH and C-O functional group and than the higher % crystallinity than before biodegradation.

Key words: bacteria and composite cellulose, silver nanoparticles, biodegradability, functional groups, and crystallinity