



SINTESIS FILM KOMPOSIT KITOSAN-TiO₂-Ag SEBAGAI MATERIAL ANTIBAKTERI

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INTISARI

Sintesis film komposit kitosan-TiO₂-Ag telah dilakukan. Tujuan dari penelitian ini adalah mempelajari pengaruh penambahan Ag terhadap sifat antibakteri dan pengaruh penambahan rasio berat TiO₂-Ag terhadap kitosan pada sifat mekanik, yaitu kuat tarik dan kemuluran pada komposit kitosan-TiO₂-Ag.

Sintesis film komposit kitosan-TiO₂-Ag dilakukan dengan menggunakan metode pencetakan pelarut. Tahapan pembuatan komposit diawali dengan sintesis TiO₂ menggunakan prekursor TTIP (Titanium (IV) Isopropoksida) dengan metode sol-gel. Setelah serbuk TiO₂ terbentuk, selanjutnya dilakukan modifikasi TiO₂ dengan Ag menggunakan metode fotoreduksi sinar UV. Selanjutnya, serbuk TiO₂-Ag yang terbentuk dilarutkan dalam larutan kitosan 2 % (b/v), kemudian dicetak pada cetakan *stainless steel* ukuran 9 x 13 cm. Pelarut dibiarkan menguap hingga terbentuk film. Film komposit dipreparasi dengan variasi penambahan berat Ag terhadap kitosan sebesar 1, 2, 3, 4, dan 5% serta variasi penambahan rasio berat TiO₂-Ag terhadap kitosan sebesar 10, 15, 20, 25, dan 30%. Selain itu, dilakukan preparasi film kitosan, film kitosan-TiO₂, dan film kitosan-Ag sebagai material perbandingan. Karakterisasi dilakukan dengan instrumen difraktometer sinar-X (XRD), spektrofotometer inframerah (FTIR), dan spektrofotometer UV-Vis difusi reflektansi (DR-UV). Selain itu, dilakukan uji sifat antibakteri dengan bakteri *E. coli* menggunakan metode hitung cawan dan uji sifat mekanik dengan menggunakan *Universal Testing Machine*.

Hasil penelitian yang diperoleh berupa hasil uji antibakteri dan hasil uji sifat mekanik. Hasil uji antibakteri menunjukkan bahwa penambahan Ag tidak hanya meningkatkan sifat antibakteri dari komposit kitosan-TiO₂-Ag, tetapi juga efektif menghambat bakteri *E. coli* pada penambahan 3, 4, dan 5% Ag. Hasil uji mekanik yang diperoleh berupa nilai kuat tarik dan nilai kemuluran. Penambahan rasio berat TiO₂-Ag terhadap kitosan meningkatkan nilai kuat tarik film komposit kitosan-TiO₂-Ag dan menurunkan nilai kemulurannya.

Kata kunci: film komposit kitosan-TiO₂-Ag, sifat antibakteri, sifat mekanik.



SYNTHESIS OF CHITOSAN-TiO₂-Ag COMPOSITE FILM AS ANTIBACTERIAL MATERIAL

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ABSTRACT

Synthesis of chitosan-TiO₂-Ag composite film has been carried out. The aim of this research are to study the effect of adding Ag for antibacterial properties and the effect of weight ratio of TiO₂-Ag to chitosan toward mechanical properties, which are tensile strength and elongation properties of chitosan-TiO₂-Ag composite film.

The method for synthesizing chitosan-TiO₂-Ag composite film was conducted by solvent casting method. First step of the synthesis was started with the preparation of TiO₂ through sol-gel method using TTIP (Titanium (IV) isopropoxide) as precursor. After TiO₂ powder was formed, modification TiO₂ with Ag was performed by photoreduction method using UV light. Next, TiO₂-Ag powder was diluted in 2% (w/v) chitosan solution and the mixed solution was casted in stainless steel container (9 x 13 cm). The solvent was left to evaporate until the film was formed. The films were prepared using various weight ratio of Ag to chitosan of 1, 2, 3, 4, and 5%, and various weight ratio of TiO₂-Ag to chitosan of 10, 15, 20, 25, and 30%. In addition, preparation of chitosan, chitosan-TiO₂, and chitosan-Ag film also carried out as comparison material. The characterization was performed using X-Ray Diffractometer (XRD), Fourier Transform Infra Red (FTIR) Spectrophotometer, and Diffuse Reflectance UV-Vis (DR-UV) Spectrophotometer. Moreover, the antibacterial properties was evaluated with *E. coli* bacteria using plate count method and the mechanical properties was tested using Universal Testing Machine.

The result of this research were antibacterial and mechanical properties. For antibacterial case, it was showed that increasing Ag in the composite not only increased the antibacterial properties of the composite but also effective for inhibiting *E. coli* bacteria in 3, 4, and 5% of Ag. The result of mechanical properties were tensile strength and elongation properties. The addition of weight ratio of TiO₂-Ag to chitosan increasing the tensile strength and decreasing elongation properties.

Key words: chitosan-TiO₂-Ag composite film, antibacterial properties, mechanical properties.