

# **PENGARUH PENAMBAHAN HEKSADESILTRIMETOKSISILAN PADA KAIN NYLON 6,6 TERDEPOSIT NANOPARTIKEL PERAK TERHADAP SUDUT KONTAK DAN AKTIVITAS ANTIBAKTERI**

Oleh :

Nurul Puji Astuti  
NIM 12307141046

Pembimbing : Dr. Eli Rohaeti

## **ABSTRAK**

Penelitian ini bertujuan untuk mengetahui pengaruh penambahan Heksadesiltrimetoksisilan (HDTMS) terhadap sudut kontak dan aktivitas antibakteri kain. Kain Nylon 6,6 yang dikarakterisasi berupa kain Nylon 6,6 tanpa modifikasi, kain Nylon 6,6 dengan penambahan HDTMS, kain Nylon 6,6 dengan penambahan nanopartikel perak, serta kain Nylon 6,6 dengan penambahan nanopartikel perak dan HDTMS.

Nanopartikel perak diperoleh dengan metode reduksi kimia menggunakan reduktor trisodium sitrat dan dikarakterisasi menggunakan Spektroskopi UV-Vis. Deposit nanopartikel perak pada kain Nylon 6,6 dengan cara diaduk selama 24 jam dan pelapisan senyawa HDTMS diaduk selama 1 jam. Selanjutnya kain Nylon 6,6 tanpa dan dengan modifikasi diuji sudut kontak dan aktivitas antibakterinya. Uji antibakteri ditentukan dengan metode difusi dan diuji signifikansi dengan ANOVA 2 arah, LSD, serta uji *t-independent*. Aktivitas antibakteri ditunjukkan dengan besar diameter zona bening.

Spektra UV-Vis memperlihatkan puncak pada panjang gelombang 429 nm yang identik sebagai nanopartikel perak. Penambahan HDTMS mempengaruhi kenaikan sudut kontak permukaan kain Nylon 6,6 yaitu menghasilkan sudut kontak sebesar 135°. Aktivitas antibakteri kain Nylon 6,6 terdeposit nanopartikel perak secara signifikan dapat menghambat pertumbuhan bakteri *Staphylococcus aureus* dan *Escherichia coli*. Modifikasi kain Nylon 6,6 dengan penambahan HDTMS dapat meningkatkan aktivitas antibakteri terhadap *Staphylococcus aureus*.

**Kata kunci:** *aktivitas antibakteri, HDTMS, kain Nylon 6,6, nanopartikel perak, sudut kontak*

# **EFFECT OF ADDITION HEXADECYLTRIMETHOXYSILANE ON NYLON 6,6 WHICH IS DEPOSITED SILVER NANOPARTICLES TO CONTACT ANGLE AND ANTIBACTERIAL ACTIVITY**

By:  
Nurul Puji Astuti  
Student Number: 12307141046

Supervisor: Dr. Eli Rohaeti

## **ABSTRACT**

This research aimed to determine the effect of Hexadecyltrimethoxysilane (HDTMS) through the contact angle and the antibacterial activity of Nylon 6,6 fabrics. Modification of Nylon 6,6 fabrics was characterized include Nylon 6,6, Nylon 6,6 with the addition of silver nanoparticles, Nylon 6,6 with the addition HDTMS, and Nylon 6,6 with the addition of silver nanoparticles and HDTMS.

Silver nanoparticles was produced by chemical reduction method with trisodium citrate as a reductor and was characterized by using UV-Vis spectrophotometer. Silver nanoparticles were impregnated into Nylon 6,6 by shaking for 24 hours, and were coated HDTMS by shaking for 1 hours. Furthermore, Nylon 6,6 and modification Nylon 6,6 were characterized by the contact angle and antibacterial activity. While antibacterial activities tested by diffusion method and then significant test by ANOVA two-ways, LSD, and t-independent. Antibacterial activity was demonstrated by a large diameter clear zone.

Characterization using UV-Vis spectroscopy showed that the peak of silver nanoparticles at a wavelength 429 nm. The addition of HDTMS affect an increased contact angle on surface of the Nylon 6.6 and the largest contact angle was 135°. The antibacterial activity of the treated fabrics loaded with silver nanoparticles was significant evaluated against bacteria *Staphylococcus aureus* and *Escherichia coli*. Modified Nylon 6,6 with the addition of HDTMS can increase the contact angle and improve the antibacterial activity of Nylon 6,6 against *Staphylococcus aureus*.

Keywords: *antibacterial activity, contact angle, HDTMS, Nylon 6,6 fabrics, silver nanoparticles*

**PENGARUH PENAMBAHAN HEKSADESILTRIMETOKSISILAN PADA  
KAIN NYLON 6,6 TERDEPOSIT NANOPARTIKEL PERAK TERHADAP  
SUDUT KONTAK DAN AKTIVITAS ANTIBAKTERI**

**Nurul Puji Astuti, Eli Rohaeti**

*Jurusan Pendidikan Kimia, FMIPA Universitas Negeri Yogyakarta*

*e-mail :rohaetieli@yahoo.com*

**Abstrak**

Penelitian ini bertujuan untuk mengetahui pengaruh penambahan Heksadesiltrimetoksisilan (HDTMS) terhadap gugus fungsi kain. Kain yang dikarakterisasi berupa Nylon 6,6, Nylon 6,6-HDTMS, Nylon 6,6-nanopartikel perak, serta Nylon 6,6-nanopartikel perak-HDTMS.

Nanopartikel perak diperoleh dengan metode reduksi kimia dengan reduktornya adalah trisodium sitrat dan dikarakterisasi menggunakan Spektroskopi UV-Vis. Deposit nanopartikel perak pada kain Nylon 6,6 dengan cara diaduk selama 24 jam dan pelapisan senyawa HDTMS diaduk selama 1 jam. Karakterisasi gugus fungsi menggunakan spektrofotometer FTIR-ATR.

Interpretasi gugus fungsi Si-O-Si dan gugus Si-C muncul pada bilangan gelombang  $1091,03\text{ cm}^{-1}$  dan  $719,76\text{ cm}^{-1}$ . Penambahan HDTMS menunjukkan penurunan intensitas serapan tanpa adanya perubahan gugus fungsi.

**Kata kunci:** *gugus fungsi, HDTMS, kain Nylon 6,6, nanopartikel perak*

# EFFECT OF ADDITION HEXADECYLTRIMETHOXYSILANE TO FUNCTIONAL GROUPS ON NYLON 6,6 WHICH IS DEPOSITED SILVER NANOPARTICLES

**Nurul Puji Astuti, Eli Rohaeti**

*Jurusan Pendidikan Kimia, FMIPA Universitas Negeri Yogyakarta*

*e-mail :rohaetieli@yahoo.com*

## **Abstract**

This research aimed to determine the effect Hexadecyltrimethoxysilane (HDTMS) the functional groups of fabrics. Modification of fabrics was characterized include Nylon 6,6, Nylon 6,6-silver nanoparticles, Nylon 6,6-HDTMS, and Nylon 6,6-silver nanoparticles-HDTMS.

Silver nanoparticles was produced by chemical reduction method with trisodium citrate as a reductor and was characterized by using UV-Vis spectrophotometer. Impragnated silver nanoparticles into Nylon 6,6 by shaker for 24 hours. Coated HDTMS into Nylon 6,6 by shaker for 1 hours. Furthermore, Nylon 6,6 and modification Nylon 6,6 were characterized by FTIR-ATR spectrophotometer.

Interpretation of functional groups Si-O-Si and Si-C at a wavelength  $719,76\text{ cm}^{-1}$  and  $1091,03\text{ cm}^{-1}$ . Addition of HDTMS indicated lower absorbance intensity without change functional groups.

**Keywords:** *antibacterial activity, contact angle, HDTMS, Nylon 6,6 fabrics, silver nanoparticles*