PENGEMBANGAN MATERIAL *SELF-COOLING* BERBASIS NANOSELULOSA BAKTERI DARI SCOBY SEBAGAI PELAPIS JENDELA

Nama Mahasiswa : 1. Nabil Septian Medy
2. Assifa Nur Rohmah

NIM : 1. 2032010023
2. 2032010008

Pembimbing : Abdul Halim, S.T., M.T., Ph.D.

ABSTRAK

Dalam era pemanasan global yang semakin mengkhawatirkan, perhatian terhadap kenyamanan suhu ruangan menjadi sangat penting. Nanoselulosa, sebagai biopolimer terbarukan, muncul sebagai solusi potensial dengan sifat *self-cooling* yang unik. *Self-cooling* yang dihasilkan struktur molekul nanoselulosa memungkinkannya untuk mendinginkan diri sendiri tanpa memerlukan pendingin eksternal. *Self-cooling* bekerja dengan pelepasan energi melalui pertukaran panas radiasi, yang kemudian di lepas ke luar angkasa. Nanoselulosa diusulkan mampu menjadi pelapis jendela yang mampu mengurangi beban pendinginan ruangan. Sehingga perlu mengeksplorasi potensi aplikasi nanoselulosa sebagai lapisan pada jendela, dengan fokus pada kemampuan pengurangan panas dan transmisi cahaya yang dapat meningkatkan efisiensi energi dan kenyamanan dalam bangunan. Nanoselulosa bakterial akan dihasilkan dari produk samping fermentasi Kombucha dengan SCOBY (*Symbiotic Culture of Bacteria and Yeast*). Hasil yang didapat akan melalui proses bleaching dengan H_2O_2 dan *solvent exchange* dengan Ethanol serta N-Hexane, untuk mengoptimalkan kejernihan dan kemampuan *self-cooling* yang maksimal. Nanoselulosa bakteri yang dihasilkan akan dikarakterisasi dengan uji SEM, FTIR, Spektrofotometri UV-Vis, dan *Self-Cooling*. Penelitian ini menunjukkan bahwa nanoselulosa bakterial dengan tambahan perlakuan *solvent-exchange* mampu mendistribusikan partikel lebih baik dibarengi turunnya transparansi. Nanoselulosa bakterial *bleaching only* memiliki transmisi 75% lebih

besar dari tambahan perlakuan *solvent exchange* 70%. Nanoselulosa bakterial yang telah dioptimalkan mampu memberikan selisih suhu yang signifikan dengan suhu lingkungan, mencapai selisih tertinggi 8,7^{o}C dan terendah 3,5^{o}C pada siang hari.

Kata Kunci : Bleaching, Nanoselulosa Bakterial, Pendingin Mandiri, SCOBY Pertukaran Pelarut.

DEVELOPMENT OF SELF-COOLING MATERIALS BASED ON BACTERIAL NANOCELLULOSE FROM SCOBY AS WINDOW COATINGS

By : 1. Nabil Septian Medy
2. Assifa Nur Rohmah

Student Identity Number : 1. 2032010023
2. 2032010008

Supervisor : Abdul Halim, S.T., M.T., Ph.D.

ABSTRACT

In an era of increasingly worrying global warming, attention to comfortable room temperature is very important. Nanocellulose, as a renewable biopolymer, is emerging as a potential solution with unique self-cooling properties. The self-cooling resulting nanocellulose molecular structure allows it to cool itself without the need for external cooling. Self-cooling works by releasing energy through the exchange of heat radiation, which is then released into space. The proposed nanocellulose is capable of being a window coating that can reduce air conditioning loads. So it is necessary to explore the potential application of nanocellulose as a coating on windows, with a focus on heat reduction and light transmission capabilities that can increase energy efficiency and comfort in buildings. Bacterial nanocellulose will be produced from the by-product of Kombucha fermentation with SCOBY (Symbiotic Culture of Bacteria and Yeast). The results obtained will go through a bleaching process with H2O2 and solvent exchange with Ethanol and N-Hexane, to optimize clarity and maximum self-cooling capabilities. The resulting nanocellulose bacteria will be characterized using SEM, FTIR, UV-Vis Spectrophotometry and Self-Cooling tests. This research shows that bacterial nanocellulose with additional solvent-exchange treatment is able to distribute particles better while reducing transparency. Bacterial bleaching of nanocellulose only had 75% greater transmittance than additional 70% solvent exchange treatment. The optimized nanocellulose bacteria are able to provide a

significant temperature difference with environmental temperature, reaching the highest difference of 8.7°C and the lowest 3.5°C during the day.

Keywords: *Bacterial Nanocellulose, Bleaching, Self-Cooling, Solvent Exchange SCOBY.*