Available online at www.sciencedirect.com
SCIENCE DIRECT®
Current Applied Physics 6 (2006) 760–765
Current Applied Physics
An official journal of the KPS
www.elsevier.com/locate/cap
www.kps.or.kr

Charge trap in self-assembled monolayer of cytochrome *b562*-green fluorescent protein chimera

Jeong-Woo Choi [a,*], Yun-Suk Nam [a], Bum Hwan Lee [b], Dong Jun Ahn [c], Teruyuki Nagamune [b]

[a] *Department of Chemical and Biomolecular Engineering, Sogang University, 1 Shinsu-dong, Mapo-gu, Seoul 121-742, Republic of Korea*
[b] *Department of Chemistry and Biotechnology, The University of Tokyo, Tokyo, Japan*
[c] *Department of Chemical and Biological Engineering, Korea University, Seoul 136-701, Republic of Korea*

Received 21 June 2004
Available online 4 June 2005

Abstract

The self-assembly layer consisting of fusion protein is investigated in molecular-scale for the construction of bioelectronic device. Cytochrome *b562* and green fluorescent protein were used as an electron acceptor and a sensitizer in the molecular layer by mimicking the photosynthesis. Self-assembled monolayer of fusion protein was formed on Au coated glass. The formation of fusion protein layer onto the Au substrate was observed by the surface plasmon resonance measurement. The surface of fusion protein layer was observed and analyzed by the scanning tunneling microscopy observation. For embodiment of the molecular electronic device, molecular arrays of fusion protein SA layer were formed by micro contact printing. Surface charge distribution of fusion protein SA layer was measured to confirm an electrical conductivity by electrostatic force microscopy observation.

PACS: 85.65.+h

Keywords: Bioelectronic device; Cytochrome *b562*; GFP; Self-assembly layer

1. Introduction

The transfer of an electron from one side of a molecule to the other or between molecules is one of the most fundamental and ubiquitous processes in electronic materials and biological systems [13]. The control and exploitation of this process in organized molecular systems is a major proposition for molecular electronics and bioelectronics [14]. Progress in molecular electronic devices engineering is still rather modest due to problems associated with the elucidation and effective control of such structures and interactions at the nanometer level.

Photoinduced electron transport processes in nature, such as photoelectric conversion and long-range electron transfer in photosynthetic organisms, are known to be occurred not only very efficiently but also unidirectionally guided by biomolecular functional groups [13,8]. The concepts for the development of new functional bioelectronic devices can be inspired from the biological systems such as the electron transfer chain or the photosynthetic reaction center. By mimicking the organization of the functional molecules in a biological electron transfer system, the biomolecular electronic devices can be realized artificially. In the initial process of photosynthesis, a biological electron transfer system,

* Corresponding author. Tel.: +82 2 705 8480; fax: +82 2 711 0439.
E-mail address: jwchoi@ccs.sogang.ac.kr (J.-W. Choi).

1567-1739/$ - see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.cap.2005.04.035