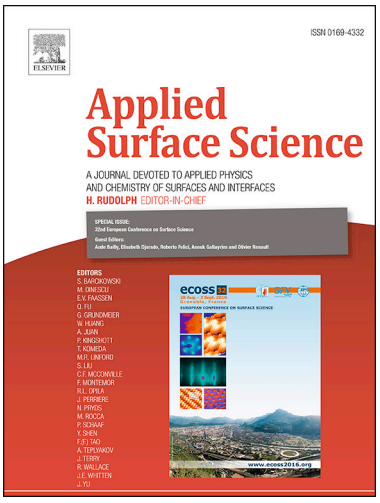
Accepted Manuscript



Full Length Article

Structural Development of Nanosilver on Metal Oxide Nanofibrous Membrane by Plasma Enhanced Chemical Vapor Deposition (PECVD)

Nakarin Subjalearndee, Dirk Hegemann, Martin Amberg, Barbara Hanselmann, Patrick Rupper, Varol Intasanta

PII: S0169-4332(18)31188-7
DOI: https://doi.org/10.1016/j.apsusc.2018.04.215
Reference: APSUSC 39214

To appear in: *Applied Surface Science*

Received Date: 19 January 2018
Revised Date: 19 April 2018
Accepted Date: 23 April 2018

Please cite this article as: N. Subjalearndee, D. Hegemann, M. Amberg, B. Hanselmann, P. Rupper, V. Intasanta, Structural Development of Nanosilver on Metal Oxide Nanofibrous Membrane by Plasma Enhanced Chemical Vapor Deposition (PECVD), *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.04.215

Structural Development of Nanosilver on Metal Oxide Nanofibrous Membrane by Plasma Enhanced Chemical Vapor Deposition (PECVD)

Nakarin Subjalearndee,[a] Dirk Hegemann,[b] Martin Amberg,[b] Barbara Hanselmann,[b] Patrick Rupper[b] and Varol Intasanta[a]*

[a]Nano Functional Textile Laboratory, National Nanotechnology Center, National Science and Technology Development Agency, 111 Phahonyothin Road, Klong Nueng, Klong Luang, Pathumthani, 12120, Thailand.

[b]Empa, Swiss Federal Laboratories for Materials Science and Technology, Advanced Fibers, Lerchenfeldstrasse 5, St. Gallen, Switzerland

Corresponding Author Email: varol@nanotec.or.th

Abstract

Deposition of functional metal films onto mechanically-sensitive nanostructures has been challenging as conventional wet reduction process could easily lead to physical damages and structural inhomogeneity at nanometer length scale. As PECVD technique not only offers noninvasive approach to single layer metal coating, it also entails processes' scalability and cost-effectiveness. In this study, we investigate the formation of metal nanolayers on visible-light active $ZnWO_4$-TiO_2 nanofibrous membrane as a model substrate against pilot-scale PECVD reactor drum's rotating speed as a key parameter at fixed internal pressure and power input. The characteristics of sputtered Ag particles are fully examined by XRD, TEM and XPS techniques. At low rotating speed (less than 0.1 m/min), thick layer of silver is observed with strong antibacterial function. At high speed (more than 18 m/min) silver thin film disappears as silver nanoislands emerge on surface of the metal oxide nanofibrous substrate suggesting nucleation stage of silver deposition. Interestingly, at 6 m/min, the obtained metal-metal oxide hybrid shows enhanced photocatalytic activity and excellent antibacterial property.

Keywords: Plasma enhanced chemical vapor deposition, wet photodeposition**,** metal oxide nanofiber, silver nanoparticle**.**