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PII: S0169-4332(13)00895-7
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2013.05.006
Reference: APSUSC 25643

To appear in: *APSUSC*

Received date: 1-12-2012
Revised date: 22-4-2013
Accepted date: 5-5-2013

Please cite this article as: H. Savaloni, R. Babaei, Surface enhanced Raman spectroscopy and structural characterization of Ag/Cu Chiral Nano-flower Sculptured Thin films, *Applied Surface Science* (2013), http://dx.doi.org/10.1016/j.apsusc.2013.05.006

Surface enhanced Raman spectroscopy and structural characterization of Ag/Cu Chiral Nano-flower Sculptured Thin films

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Abstract

Silver chiral nano-flower sculptured thin films with 3-, 4- and 5-fold symmetry were produced on copper substrates using oblique angle deposition method in conjunction with rotation of sample holder with different speeds at different sectors of each revolution corresponding to symmetry order of the acquired nano-flower. Atomic force microscopy (AFM) and field emission scanning electron microscopy (FESEM) were employed to obtain morphologies and nano-structure of the films. Raman spectroscopy was performed on all samples that were subject to impregnation by 4,4'-Bipyridine ($C_{10}H_8N_2$) solution. A high degree of enhancement of the main bands at 1610, 1297, and 1009 cm^{-1} that can be assigned to the C=C stretching mode, aromatic ring stretching ring and in-plane ring mode of 4,4'-Bipyridine, is achieved.

Keywords: Silver chiral nano-flowers; Sculptured thin films; Surface enhanced Raman spectroscopy; 4,4'-Bipyridine

1. Introduction

Metallic nano-structures with specific properties dependent on their size and geometrical shape have created an interesting research environment for scientist in different fields of application such as biomedicine [1-6], antibacterial [7], and optics [8-10].

The oblique or glancing angle deposition method together with rotation of substrate about the substrate surface normal is used to produce sculptured nanostructures with pre-designed