

OR0802

Development of plasmonic thin films composed of metallic nanoparticles (Au, Ag, Cu) dispersed in AlN

M. S. Rodrigues¹, R. P. Domingues¹, D. Costa¹, F. J. Oliveira², R. F. Silva², S. Koneti³, L. Roiban³, P. Steyer³, J. Borges¹, F. Vaz¹

¹Universidade do Minho, Braga, Portugal ²Universidade de Aveiro, Aveiro, Portugal ³ INSA de Lyon, Lyon, France

mprodriques@fisica.uminho.pt

In the past few years, plasmonic nanoparticles (e.g. Au and Ag) have been intensely investigated due to their unique optical properties. The physical phenomenon assigned to these materials is the so-called Localized Surface Plasmon Resonance (LSPR) phenomenon, which results from charge density oscillations, confined to the noble metal nanoparticles. The optical properties of plasmonic nanoparticles can be tailored from their specific amount, but also their spatial and geometric characteristics (size, shape and distribution) and surrounding dielectric environment. The combination and change of all these characteristics may give rise to tuneable LSPR resonance peaks in various regions of the electromagnetic spectrum, namely the visible range, with corresponding change in coated surface colourations. For those reasons, nanoplasmonic thin films are considered to be useful for a wide range of technological applications, varying from simple decorative purposes to more ambitious ones such as the case of the detection of molecules (e.g. SERS or gas sensing) and biological agents (e.g. optical LSPR-biosensors), among several other examples. In this presentation, the possibility of using AlN as a host matrix for LSPR thin films and how their optical responses are correlated with the concentration and distributions of plasmonic nanoparticles of Au, Ag or Cu will be discussed and correlated with some targeted sensing applications. The thin films (Au/Ag/Cu:AlN) are deposited by magnetron sputtering, followed by a thermal annealing process in order to promote the formation of nanoparticles with different size distributions throughout the matrix. Different sets of films with variable Au, Ag or Cu concentrations are prepared and characterized by different techniques, including High Resolution Transmission Electron Microscopy (HRTEM) in order to correlate the LSPR behaviour with the particular changes in the morphological features.

Keywords

LSPR

Au, Ag, Cu Nanoparticles

AlN Matrix