PO1003

OES characterization of a nanoparticles source based on magnetron sputtering

Vanessa Orozco, Cédric Jaoul, Frédéric Dumas-Bouchiat, Pascal Tristant

Université de Limoges, Limoges, France

maileth.orozco@etu.unilim.fr

Among the processes allowing the production of nanoparticles, gas aggregation technique based on magnetron sputtering is a very interesting method. This technique is compatible with classical microfabrication methods and thus nanoparticles can be integrated in a functional thin film obtained by vapor deposition. Moreover it can be applied to numerous materials, a high flux can be achieved and thanks to the plasma, particle agglomeration is limited. The size of the nanoparticles can be tuned by varying the operation parameters like gas flow-rate, aggregation distance and sputtering power. Nevertheless, depending on the sputtered material and the processing gases, the process operating windows allowing the nanoparticles nucleation and growth can be limited and temporal instabilities may occur [1,2].Objective of this work is a better understanding of a nanoparticles source dedicated to the deposition of ceramic based nanocomposite thin films. Silver, was chosen as a first material to be sputtered by argon at room temperature and a pressure of 2×10^{-1} mbar. A quartz crystal microbalance (QCM) was used for measuring the deposition rate during the nanoparticle generation. The intensities of light emitted by the desexcitation of excited species from the plasma were measured by optical emission spectroscopy (OES). The influences of the discharge power, the aggregation length and the presence of additional gas like He, N_2 or O_2 were investigated.Nanoparticles deposition rate depends of the reactive gas flow injected into the aggregation chamber. The size distributions of nanoparticles have been investigated using TEM. The metallic nanoparticles can be synthesized in a broad range of sizes – from a few nanometers to tens of nanometers - according to the operating conditions.

[1] T. Peter, O et al. J. Appl. Phys 112, 114321(2012).
[2]. J Polášek et al. Thin Solid Films (2015)

Keywords
Nanoparticles
Magnetron Sputtering
Gas Aggregation Source
OES
QCM