Effect of Ge addition in the thermal stability and microstructure Ag/Ge/AlN nano-multilayer system

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Nowadays, the development of new industrial nanostructured metallic filler materials for advanced low temperature joining applications requires a new approach to joints technology. Requirements move to reductions in joining temperature and time but also to improvements in the mechanical strength of the joint. The Nano multilayer systems were chosen to accomplish this task [1-5]. In this work the thermal stability and microstructure of the Ag/Ge/AlN nano-multilayer coating obtained by magnetron sputtering under different disposition conditions were investigated. The combinational approach to study the annealed coating, in Air and Ar atmosphere at 3 different temperatures (200º, 400º and 700 ºC) was carried out using HRSEM, XRD, in situ HT-XRD and RAMAN analysis. The first changes on the surface of the nano-multilayer were observed before fast annealing at 200°C in air atmosphere. BIAS application during the deposition of coating had a very strong influence on the morphology and structure of nano-multilayers due to the supplementary energy that allows Ag atoms to find the most opportune orientation. The presence of Ge slows down the outflow of Ag to the surface, owing to the solid solution formation at high temperature and higher surface diffusion during deposition as well as possible mixing between Ag and AlN layers The tensile stress induced by the Ge in the Ag layers was observed; unlike in the results in previous works [6-7].

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