

P. Żukowski, T. Kołtunowicz, J. Partyka, Yu.A. Fedotova, A.V. Larkin. Electrical properties of nano-structures $(\text{CoFeZr})_x + (\text{Al}_2\text{O}_3)_{1+x}$ with use of alternating current // Vacuum.- 2009 (принята в печать).

CoFeZr-Al₂O₃ nanocomposite films of 3-5 μm thickness, containing metallic alloy nanoparticles embedded into the dielectric alumina matrix, have been deposited on a glass ceramic substrate using magnetron sputtering of composite target in Ar gas ambient. Measurements of AC conductance and lagging have been performed within the frequency range of 50 Hz-1 MHz at the temperatures from 79 K to 373 K in the initial (as-deposited) samples as well as directly after their isochronous (15 min) annealings within the temperature range from 398 K to 648 K with 25 K step. The observed variations of real part AC electrical conductivity with temperature and frequency $\sigma_{\text{real}}(T, f)$ in the as-deposited films display transition from dielectric to metallic behaviour when crossing the percolation threshold x_c in the studied nanocomposites. After annealing of the samples below the x_c the $\sigma_{\text{real}}(T, f)$ progress follows the hopping law of electron conductivity with sigmoidal frequency dependence. The samples being far beyond the percolation threshold revealed transition from metallic to activation $\sigma_{\text{real}}(T)$ law after high-temperature annealing attributed to the internal oxidation of metallic nanoparticle by excess of oxygen presented in the as-deposited samples.

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