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High rate sputtered thick films

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The industry today makes wide use of thick protective and functional coatings up to 100-200 mcm in thickness. There are numerous chemical, electrochemical and physical methods for thick films production. PVD methods, such as EB, Laser and Arc PVD yield high rate of films deposition and provide some advantages over chemical and electrochemical techniques. It is thought that magnetron sputtering does not possess the required productivity and unusable for thick coatings preparation although such a possibility was already discussed in early works [1]. Meanwhile there are DC magnetrons with deposition rate 2-5 mcm/min [2]. By the magnetron sputtering of copper-carbon mosaic targets with variable graphite content composite Cu-C coatings of 50-170 mcm in thickness were produced in present work with deposition rate up to 2.73 mcm/min. The films' structure is similar to those of micron and submicron thin Cu-C films produced earlier [3]. XPS measured % sp^2 bonds 45-70% together with RFA data describe the carbon component as a-C. Coatings with carbon content less than 20% do not show the signs of peeling and crack development under diamond indenter loading 150 N. Analysis of indenter's imprints at substantially different loadings testify to the effect of high plasticity of the coatings. Friction measurements in dry conditions and liquid and solid lubricants assisted show coefficients of friction 0.08-0.15. Wear of coatings at loading 40 N was $2x10^{-7}$ mm^3 /N/m. Electrical resistivity of coatings increases nonlinear from several mcOhm.cm to 150 mcOhm.cm with rising of carbon content to 20%. Such a relationship common to alloys suggests high dispersivity and uniformity of produced Cu-C nanocomposites.

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