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Thermionic vacuum arc carbon-metal co-deposition for antifriction coatings

C. P. Lungu, C.C. SurduBob, A. M. Lungu, O. Pompilian, C. Porosnicu, V. Zaroschi, I. Mustata

National Institute for Lasers, Plasma and Radiation Physics, Bucharest-Magurele, Romania

The antifriction surface coatings are very much studied nowadays in order to save the consumed energy, to prolong the life time of the moving devices in superficial contacts with each other. One of the most promising antifriction coating proved out to be the diamond like carbon (DLC) one especially due to its following attractive characteristics: high hardness; low friction coefficient; low inherent surface roughness; chemical inertness; low surface energy determining a significant anti-stick behaviour. But pure DLC coatings exhibit a significant compressive stresses and this, as was demonstrated elsewhere [1] can be reduced by incorporating some metal elements in the DLC matrix. It is found out that increasing the metal concentration, the stress and the hardness decreases. For this reason an optimum compromise must be done with respect to both the nature of metal and its concentration in the DLC structure in close relationship with the nature and conditions of the sliding surfaces. In this paper we propose a very attractive method to obtain combined carbon-metal (metal: Al, Cu, Ag, Sn) structures with atomically smooth surfaces, no gas containment, low friction coefficient, and good enough hardness applicable to sliding surfaces without or with electrical contacts. The carbon – metal co-depositions take place in high vacuum condition, from two independent low current high voltage discharges in carbon and metal vapors. In this case the deposition benefits of carbon and metal energetic (some hundreds of eV) ions bombardments with all the advantages implied by this.

[1] C. P. Lungu, I. Mustata, G. Musa, et al., J. of Optoelectronics and Adv. Mat. **8**, 74 (2006).