OR0501

Investigations on the energy influx at substrate surface during reactive magnetron sputtering

Maik Fröhlich[1], Viktor Schneider[2], Daniel Lundin[3], Sven Bornholdt[1], Holger Kersten[1]

[1]IEAP, University of Kiel, Kiel, Germany [2]IMW, University of Kiel, Kiel, Germany [3]IFM, University of Linköping, Linköping, Sweden

froehlich@physik.uni-kiel.de

According to the high flexibility of magnetron sputter processes due to a large number of adjustable parameters this technology provides a large spectrum of applications. Magnetron sputtering allows the deposition of various coatings with particular properties. Therefore, this method of coating manufacture is applied in several fields, e.g. optics, semiconductor technology, refinement of materials, erosion protection etc. For special applications metal oxide, metal nitride or combined coatings are often necessary to deposit by reactive plasma processes. By using reactive magnetron sputtering a combination of high deposition rate and needed magnitude of reactive gases (O_2, N_2) for optimized coating properties can be achieved.
In this work the influence of process conditions on depositing alumina and copper oxide by reactive magnetron sputtering was investigated. The unbalanced magnetron source was operated in DC-mode using aluminum or copper targets, respectively. The interest was drawn on the energetic as well as thermal conditions at substrate surface 12 cm in distance from the sputter source. The energy influx caused by different contributions by electrons, ions, neutrals and radicals as well as by heat radiation and reactions taking place at the substrate surface was measured by a calorimetric probe [1]. By varying the bias potential of the probe the effect of charge carriers was investigated and the influence of insulating coatings will be discussed. Moreover, the impact of target poisoning on heating of the substrate will be shown in detail.

[1] M. Stahl, T. Trottenberg, H. Kersten, Rev. Sci. Instrum. 81 (2010), 013503

Keywords
reactive plasma
magnetron sputtering
calorimetric probe