OR0702

Reactive Sputter Deposition of Alumina Coatings by HIPP Processes

Ralf Bandorf[1], Holger Gerdes[1], Daniel Loch[1], Günter Bräuer[1]

[1]Fraunhofer IST, Braunschweig, Germany

ralf.bandorf@ist.fraunhofer.de

Highly Ionised Pulse Plasma processes (HIPP processes) like High Power Impulse Magnetron Sputtering HiPIMS and Modulated Pulse Power MPP have matured in recent years. Actually research focuses increasingly on development for industrial processes. HIPP processes offer a tool for tailoring the film properties and to improve hardness, density, refractive index, and many more properties beyond state of the art. Alumina coatings are used besides application in cutting tools as insulator for electric and sensor applications.
This paper focuses on the process development of an industrial process for deposition of alumina with improved properties. Concerning productivity a high rate deposition process is required for economic production. Therefore the deposition rate must be increased or the film properties improved in a way that thinner films exceed reference films prepared with state of the art technology. Both MPP and HiPIMS, including MF-superposition were investigated and the resulting rates are reported. The films were prepared both without feedback control close to the threshold of the transition to oxide mode and with feedback control. The benefits and drawbacks of the different approaches are discussed. Regarding the insulating properties the films were characterized by their breakdown voltage. MPP films with 1 µm thickness showed breakdown voltages of 1.6 kV. The SEM cross sections of the prepared films showed a dense glassy structure for all the HIPP films.

Keywords
HiPIMS
MPP
reactive process control
alumina
insulator