Control of reactive deposition process by stabilization of the power supply work

J. Kazuss, V. Kozlov, E. Machevskis

Abstract

Oxide coatings deposition in reactive process from metallic targets has particular importance thanks to cheapness of metallic target in comparison with conductive ceramic targets. Silicon oxide can be deposited only from a metallic target or from dielectric target by RF-sputtering, but deposition speed in case of RF-sputtering is low.

Reactive sputtering of metallic targets is characterized by voltage hysteresis and has a characteristic appearance depending on type of metal and value of secondary electronic emission factor for metal and oxide.

From voltage-current (VC) characteristics follows, that for silicon oxide (SiO_2) deposition it is necessary to work in power supply constant voltage mode and for titanium oxide (TiO_2) deposition - at constant current mode and at constant oxygen flow. But it appears insufficiently. For process stabilization it is necessary to stabilize the second electric parameter by changing oxygen flow in the chamber. We develop an algorithm and a control system of process for this case.

As a result in process there is only one variable value of process which can be controlled, this is oxygen flow, at a constant pumping speed, leakage, etc. In this case process will be stabilized. Changes of outgasing flow during process as a result of heating of design elements of a chamber will be considered also. Stabilization of parameters of the power supply creates favorable conditions for reproducibility of properties of a coating.

In the work results of process stabilization are presented at SiO_2 and TiO_2 coating deposition on polymeric PET film.