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Suppression of High-Energy Backscattered Species in Magnetron Sputter Plasma with Cylindrical Cathode HIROTAKA TOYODA, YUSUKE TAKAGI, Nagoya University, HIDEO SUGAI, Chubu University — Recent application of magnetron plasma to nano-scale devices requires high-quality films, e.g., magnetic multilayer films with nano-scale flat interface and with no mixing of atomic components at the interface. In general, surface qualities of sputter deposited films are influenced by incidence of particles with kinetic energies much higher than bond energies of deposited materials. Recently, we have shown abundant flux of high energy (100-200 eV) Ar atom and Ar^+ ion those are produced by backscattering of Ar^+ on the target, i.e., ejection of high-energy Ar atom from target. In this paper, we propose a new magnetron source to suppress high energy Ar and Ar^+ flux using a cylindrical cathode instead of planar cathode. Energy distribution function (EDF) of Ar^+ is measured by a QMA with an energy analyzer. It is shown that a quantity of energetic Ar^+ is much less than that of a conventional plane type cathode. In parallel with the measurement of the Ar^+ EDFs, a Monte Carlo code which simulates Ar and Ar^+ EDFs is developed. The simulation well explains the Ar^+ EDFs and shows that a quantity of the energetic Ar atom is considerably small compared with the plane type cathode. Experimental and simulation results suggest that incidence of energetic particles on the substrate is suppressed in the cylindrical magnetron sputter source.

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