COMPUTER SIMULATION OF MICROSTRUCTURE OF THE FILMS DEPOSITED BY MEANS OF A SPUTTERING PROCESS

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1. Simulation Model : Sputtering system : Facing target sputtering system
Film material : Cobalt, Sputtering gas : Argon gas

- (1) Transportation of sputtered particles from target to substrate
 - ★ Monte Carlo method (Calculation of the trajectories of each sputtered particles)
 - Incidence angles and energy of sputtered particles arriving at substrate
- (2) Deposition of sputtered particles on film surface :
 - ★ Surface migration of deposited particles : Muller's model
 - ★ Effect of kinetic energy of deposition particles : Molecular dynamics simulation
- (3) High energy particle bombardment to the film surface : Molecular dynamics simulation:
(Potential function: Morse potential, and Zeigler's Universal potential)

2. Microstructure of Cobalt Films :

★ Surface migration due to thermally stimulated hopping

Deposition conditions : Substrate temperature : 500 K and 600 K,
Argon gas pressure : 2 mTorr and 10 mTorr, Deposition rate : 100 Å/min

In-plane cross section

In-plane cross section

In-plane cross section

Substrate Cross section

Substrate Cross section

Substrate Cross section

(a) 2 mTorr, 500 K

(b) 10 mTorr, 500 K

(c) 10 mTorr, 600 K

★ High energy particle bombardment of the film surface : Movement of atoms in the film induced by the bombardment of high energy argon ions.

(a) bombardment of 20 eV argon ion

(a) before Ar ion bombardment

(b) bombardment of 100 eV argon ions

(b) After 10 shots of Ar ions with 20 eV