

## Etch rate prediction for Ion milling machine

SAE is producing writing/reading heads for computer harddisk. This heads is a tiny parts which are fabricated from a wafer. Etching is one of the important process in which a desired pattern on head is obtained. The etching process is performed in an Ion milling machine. To control the pattern depth, we need to predict the etch rate of the machine.

Until now, we know some factors are affecting the etch rate.

1. Number of wafer

One ion milling machine can process up to four wafers at a time. To our understanding, during the etching process, the sub-product produced will hinder the process; therefore, if there are more wafer inside the process chamber, the more sub-products will be formed.

2. Type of wafer

We process different kind of wafer in working days randomly. Those wafers are different in material, hardness etc. This will affect the etch rate.

Some of the factors are embedded in “type of wafer”, for example, voltage and power and other tangled electrical setting, they are default by type of wafer.

3. Type of gas

We use different media in etching. Argon and oxygen are most common which give different performance.

4. Direction of ion beam

The incidence angle of the ion beam is different in terms of wafer type, for example 30 deg and 60 deg. The etch rate will be different.

5. Working time / Idle time / Periodic maintenance

a) As mentioned in 1), sub-product is produced in the chamber, the longer the machine is in operation, the larger amount of sub-product is accumulated in the chamber. This factor is not sure because some cleaning procedure is proceeded after etching.

b) If the machine is not in operation for a couple of hours, it takes some time to “warm up”. We do not know the actual cause but it is sure that the etch rate is most unstable after long time idle.

c) We need to do a full check and maintenance every 6000 minutes of operation. Etch rate is most difficult after this maintenance.