

[II-13]

The Influence of He flow on the Si etching procedure using chlorine gas

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Dry etching technique provides more easy controllability on the etch profile such as anisotropic etching than wet etching process and the results of lots of researches on the characterization of various plasmas or ion beams for semiconductor etching have been reported. Chlorine-based plasmas or chlorine ion beam have been often used to etch several semiconductor materials, in particular Si-based materials.

We have studied the effect of He flow rate on the Si and SiO₂ dry etching using chlorine-based plasma. Experiments were performed using reactive ion etching system. RF power was 300 W, Cl₂ gas flow rate was fixed at 58.6 sccm, and the He flow rate was varied from 0 to 120 sccm. Fig. 1 presents the etch depth of Si layer versus the etching time at various He flow rate. In case of low He flow rate, the etch rate was measured to be negligible for both Si and SiO₂. As the He flow increases over 30 % of the total inlet gas flow, the plasma state becomes stable and the etch rate starts to increase. In high He flow rate (over 60 %), the relation between the etch depth and the time was observed to be nearly linear. Fig. 2 presents the variation of the etch rate depending on the He flow rate. The etch rate increases linearly with He flow rate. The results of this preliminary study show that Cl₂/He mixture plasma is a good candidate for the controllable Si dry etching.

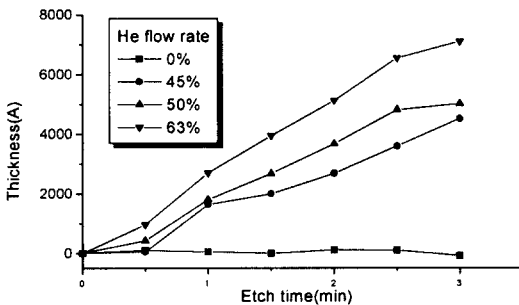


Fig. 1

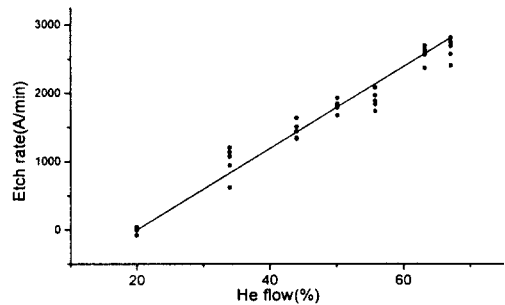


Fig. 2

Fig. 1 : This figure presents the etch depth of Si versus the etching time at various He flow rate.

Fig. 2 : This figure presents the variation of the etch rate depending on the He flow rate.