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Dry etch characteristics of Al2O3 thin film using an inductively coupled plasma system

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Aluminum-oxide (Al_2O_3) thin films find a number of applications in optoelectronics, sensors and devices. Moreover, Al_2O_3 thin film is one of the most promising high-k materials as gate dielectrics with high dielectric constant of ~10, low leakage current, high breakdown strength and good thermo-dynamical stability in contact with Si. However, during the etching process, the wet etching method is not applicable due to low purity, high temperature of working solution and high etching selectivity. Dry etching has been used for most of the integrated circuits fabrication steps for its finer patterns than wet etching. With high-density plasma, easy control of ion energy and flux, low ownership and simple structure, inductively coupled plasma (ICP) system was used in our test.

In our study, the investigation of Al_2O_3 etch characteristics in an inductively coupled plasma was carried out in terms of effects of input process parameters, such as gas mixing ratio, substrate temperature and process pressure. The selectivity of Al_2O_3 to SiO_2 is also studied for above parameters. The changes of the side wall profile were investigated with scanning electron microscopy (SEM). The cross-sectional image for MTJ was performed by transmission electron microscopy (TEM)

Keywords
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