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Plasma etching behavior of RE-Si-Al-O glass (RE: Y, La, Gd)

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The particle generation during the plasma enhanced process is highly considered as serious problem in the semiconductor manufacturing industry. The material for the plasma processing chamber requires the plasma etching characteristics which are homogeneously etched surface and low plasma etching depth for preventing particulate contamination and high durability. We found that the materials without grain boundaries can prevent the particle generation. Therefore, the amorphous material with the low plasma etching rate may be the best candidate for the plasma processing chamber instead of the polycrystalline materials such as yttria and alumina. Three glasses based on SiO_2 and Al_2O_3 were prepared with various rare-earth elements (Gd, Y and La) which are same content in the glass. The glasses were plasma etched in the same condition and their plasma etching rate was compared including reference materials such as Si-wafer, quartz, yttria and alumina. The mechanical and thermal properties of the glasses were highly related with cationic field strength (CFS) of the rare-earth elements. We assumed that the plasma etching resistance may highly contributed by the thermal properties of the fluorine byproducts generated during the plasma exposure and it is expected that the Gd containing glass may have the highest plasma etching resistance due to the highest sublimation temperature of GdF_3 among three rare-earth elements (Gd, Y and La). However, it is found that the plasma etching results is highly related with the mechanical property of the glasses which indicates the cationic field strength. From the result, we conclude that the glass structure should be analyzed and the plasma etching test should be conducted with different condition in the future to understand the plasma etching behavior of the glasses perfectly.

Keywords: plasma etching, plasma chamber, glass, rare-earth element

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Deposition of copper oxide by reactive magnetron sputtering

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Copper oxide films have been deposited on silicon substrates by direct current magnetron sputtering of Cu in O2 / Ar gas mixtures. The target oxidation occurring as a result of either adsorption or ion-plating of reactive gases to the target has a direct effect on the discharge current and the resulting composition of the deposited films. The kinetic model which relates the target oxidation to the discharge current was proposed, showing the one-to-one relationship between discharge current characteristics and film stoichiometry of the deposited films.

Keywords: Cu oxide, Sputtering