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Study of improved Surface Conductivity of Ceramics by Ion Implantation

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Currently, ceramic materials are used in various areas such as the machinery and semiconductor industries. However, the accumulation of static electricity on the ceramic surface causes defects in peripheral devices and semiconductor wafers. To prevent this, a conductive ceramic material capable of preventing static electricity is produced by mixing carbon nanotubes or metal powder with ceramics, but it is very expensive and has disadvantages such as non-uniformity in conductivity and changes in the properties of the material. This study investigates the principle of preventing static electricity in ceramics by ion implantation, where the electrical resistance of the ceramic surface decreases when ion implantation is performed using plasma treatment with a neutral gas.

The principle of improving the electrical conductivity of ceramic surfaces when plasma gas ion beams were implanted into ceramic surfaces has not been studied yet. However it was expected that gas ions accelerated with high energy would change the structure of the ceramic surface to form new bonds. In order to analyze and prove this phenomenon, 1E+14 to 1E+16 nitrogen gas ions accelerated to 50 keV were implanted into Al2O3 ceramics, respectively. To investigate the surface structural changes induced by ion implantation, the following surface analyses were conducted. XPS was utilized for bonding structure analysis, RBS was employed to verify the implanted ion dose, and SIMS was used to obtain depth profiles. Based on these analytical data, the principle of preventing static electricity in ceramics through ion implantation was investigated.

Paper submission Plan

Yes

Best Presentation

Yes

Contribution track

ICABU WG4. Applications of Particle Beams

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