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Growth of epitaxial Al2O3 films on silicon by ionized beam deposition

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Epitaxial Al_2O_3 films have been successfully grown on silicon substrate by the ionized beam deposition using Al ion beam in oxygen atmosphere. The crystalline quality dependence of the Al_2O_3 films on the growth temperatures and the substrate states was investigated. Using *in situ reflection high energy electron diffraction*, the orientation relationships between epitaxial Al2O3 films and Si substrate were found to be (100) Al2O3//(100) Si with [110] Al2O3//[110] Si and (111) Al2O3//(111) Si with [112] Al2O3//[112] Si. The stoichiometry of the grown films was found to be similar to that of sapphire from XPS measurements. The epitaxial films were formed at lower temperature on the oxidized Si substrate than the clean ones.