

AN ABSTRACT OF A THESIS

KINETICS OF BOROSILICATE GLASS DEPOSITION

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Master of Science in Chemical Engineering

The main objective of this research project was to investigate the kinetics of borosilicate glass film deposition on silicon using boron nitride as a solid source. The purpose of this research was to obtain experimental data on the thickness of borosilicate glass as a function of temperature and process times under controlled atmospheric conditions. Though the literature provides data from commercial scale processes as well as limited lab scale data, it is not sufficient to conclude a kinetic model. A thorough experimental work on a laboratory scale was needed, which served as the motivation behind this project. The challenge lay in designing an experiment in which the gas phase transients experienced on the commercial scale could be minimized or eliminated. After processing wafers, the thickness and composition of the borosilicate glass were measured using scanning Auger spectroscopy and a helium neon ellipsometer. The thickness of the borosilicate glass as a function of time for various temperatures are presented.

Results suggest a chemical reaction controlled process at short processing times. At longer times, a rapid transition occurs to control by diffusion with an activation energy of 3.03 eV. Finally, the partial pressure of water vapor was found to have a potentially significant effect on the rate of borosilicate glass deposition.

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CERTIFICATE OF APPROVAL OF THESIS

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