Study on Diffusion Profile of Impurities in Crystaline Silicon

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This study investigates the fabrication of p-n junctions on silicon wafers through furnace doping and the simulation of laser doping processes. The primary focus is on understanding the fundamental principles of semiconductor doping, particularly the use of Phosphoric Acid as a dopant precursor. The furnace doping process involved applying a precursor layer to silicon wafers, followed by heating to 1000°C, resulting in successful phosphorus doping, as confirmed by Energy-dispersive X-ray spectroscopy (EDX) analysis. However, an unexpected thin white layer formed on the samples, necessitating further investigation into its composition and potential impact on the doping process.

Due to constraints in equipment availability, the study also employed COMSOL Multiphysics software to simulate laser doping. These simulations provided valuable insights into optimizing doping parameters, predicting dopant profiles, and understanding the effects of different laser types (continuous wave and pulsed) on the doping process. The results highlight the importance of precise control over doping conditions, such as dopant concentration, temperature, and cooling rate, to achieve desired electronic properties in semiconductor devices.

This research contributes to the field of semiconductor fabrication by providing a comprehensive comparison of furnace and laser doping techniques, along with practical recommendations for optimizing the doping process. The findings lay the groundwork for future experimental work and offer a pathway to more controlled and efficient methods for p-n junction fabrication.

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