

SM-P028

## SIMS Study on the Diffusion of Al in Si and Si QD Layer by Heat Treatment

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Aluminum is widely used as a material for electrode on silicon based devices. Especially, aluminum films are used as backside and front-side electrodes in silicon quantum dot (QD) solar cells. In this point, the diffusion of aluminum is very important for the enhancement of power conversion efficiency by improvement of contact property. Aluminum was deposited on a Si (100) wafer and a Si QD layer by ion beam sputter system with a DC ion gun. The Si QD layer was fabricated by 1100°C annealing of the SiO<sub>2</sub>/SiO<sub>1</sub> multilayer film grown by ion beam sputtering deposition. Cs ion beam with a low energy and a grazing incidence angle was used in SIMS depth profiling analysis to obtain high depth resolution. Diffusion behavior of aluminum in the Al/Si and Al/Si QD interfaces was investigated by secondary ion mass spectrometry (SIMS) as a function of heat treatment temperature. It was found that aluminum is diffused into Si substrate at 450°C. In this presentation, the effect of heat treatment temperature and Si nitride diffusion barrier on the diffusion of Al will be discussed.

**Keywords:** Aluminum, Si, SIMS, Diffusion

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## Investigations of Graphene Grown on Copper Substrates

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Chemical vapor deposition (CVD) method is usually used to grow high-quality large area graphene. In the CVD process, copper is an especially important catalytic-substrate due to the fact that graphene films grown on Cu foils are predominantly one monolayer thick. In this study, we have grown graphene on several types of copper substrates: Cu foils and copper single crystal surfaces such as Cu(100) and Cu(111) are chosen. To investigate the differences between graphene grown on foils and single crystals, we use Raman spectroscopy, X-ray diffraction and atomic force microscopy. Details of the experimental results will be presented.

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