DETERMINATION OF HYDROGEN CONCENTRATION IN a-SI AND a-GE LAYERS BY ELASTIC RECOIL DETECTION ANALYSIS

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Hydrogenated amorphous Si and Ge films are of current interest in academic and industrial research due to their unique physical properties and important applications. The incorporation of hydrogen in the amorphous network is an accepted means for reducing the density of defect states in the midgap. The passivation of dangling-bonds leads to a significant improvement in the electronic and optical properties of these layers. However, hydrogen is also suspected to degrade the performance of amorphous Si and Ge material and devices. Several studies related to hydrogen motion have been proposed to explain the light and thermal degradation effect in these layers. Thus, to improve the performance and reliability of these devices it is crucially important to understand the role of hydrogen in amorphous layers.

In our previous works [cit] the structural changes of hydrogenated a-Si/Ge multilayers as a function of annealing condition was investigated. It was show that during annealing the samples underwent the significant structural changes. Due to the fast out diffusion of hydrogen from the layers the bubbles and craters were created on the surface. It was predicted that the hydrogen first released from the Ge layers because of the lower binding energy.

In this report, we have studied the individual a-Si and a-Ge hydrogenated layers prepared by RF sputtering on Si (100) substrates. The absolute value of atomic content of the H was determined by Elastic Recoil Detection Analysis (ERDA) using MeV He⁺ ions. The dynamic of the out diffusion was investigated by annealing at 350 °C for several hours. It was clearly shown that hydrogen can diffuse out faster from Ge film than from the Si one during post-annealing.