A Study on the Passivation Characteristics according to the RF-power Variable of Tunnel Oxide Layer Using $N_2O$ Gas

Sehyeon Kim [1], Sanguk Han [1], Sooyoung Park [1], Geonju Yoon [1], Youngseok Lee [1], Sangho Kim [1], Seongho Jeon [1], Donggi Shin [1], and Junsin Yi [1]

[1]Sungkyunkwan Univ., Korea, Republic of

Recently, Silicon oxide layer for tunneling effect has been used in many fields including silicon solar cell. The tunnel oxide layer increases lifetime and $iV_{oc}$ selectively electron transporting through tunneling and passivation. In this experiment, the tunnel oxide was deposited by PECVD(Plasma Enhanced Chemical Vapor Deposition) using $N_2O$, RF-power was varied to process the tunnel oxide. Deposition rate increased with increasing RF-power under substrate temperature 300°C, $N_20$ 50 sccm, 150 mTorr of working pressure. After a certain time, the thickness became constant because deposition rate decreased. C-V analysis shows more neutral charge than $SiN_x$ which is positive charge. After that, the phosphorus doped a-Si layer deposited as the upper layer was annealed with $N_2$ gas, 850 °C, 1hour and $H_2$ (15% $H_2$/ Ar), 400°C 30min. After annealing, lifetime and iVoc were measured using Lifetime Tester(WCT-120), conditions were optimized in RF-power 200W, substrate temperature 300°C (lifetime 762 µs, iVoc 733 mV). According to RF power increased, the content of oxide was increased while the content of nitrogen was decreased. This was related to the increased of lifetime.