Thermal Stability of Atomic Layer Deposited Nb2O5 Layer as Electron-selective Contacts on c-Si Solar Cells

Borong sang[1], Bram Hoex[2]

[1] *PhD student, School of Photovoltaic and Renewable Energy, UNSW, Sydney, Australia*

[2] *Associate Professor, School of Photovoltaic and Renewable Energy, UNSW, Sydney, Australia*

E-mail: b.sang@student.unsw.edu.au

Carrier selective contacts (CSC) with transparent metallic oxide layer for passivation have been applied on c-Si solar cells to improve the power conversion efficiency (PCE) for years. Kinds of novel materials are examined to be suitable as passivating contacts, as either electron-selective or hole-selective contacts. Atomic layer deposited (ALD) Nb_2O_5 was recently proved to be potentially applied as electron-selective contact with a low surface recombination and low contact resistivity[1].

However, the thermal stability of Nb_2O_5 as passivating contact has not been investigated completely yet. In this work, Tris(diethylamido)(tert-butylimido) Niobium(V) is used as ALD precursor to prepare the Nb2O5 layer on Si wafer via both thermal ALD and plasma-enhanced ALD at different temperature. The changes in performance of thin film from as-deposited state to post-annealing state are investigated using different characterizing techniques. This work is in process and a further investigation of thermal stability of ALD Ti_xNb_yO on c-Si solar cells is in the plan. As both Ti[2] and Nb oxide show good performance on the silicon wafer as electron selective contact, the alloyed oxide is worth to investigate in combination of both advantages.

In conclusion, more experimental details will be presented after upcoming investigation. Nb_2O_5 shows great potential in good thermal stability which is ideal for being passivating contact for c-Si solar cells.

Reference

[1] B. Macco *et al.*, “Atomic-layer deposited Nb2O5as transparent passivating electron contact for c-Si solar cells,” *Sol. Energy Mater. Sol. Cells*, vol. 184, no. April, pp. 98–104, 2018.

[2] X. Yang, Q. Bi, H. Ali, K. Davis, W. V. Schoenfeld, and K. Weber, “High-Performance TiO2-Based Electron-Selective Contacts for Crystalline Silicon Solar Cells,” *Adv. Mater.*, pp. 5891–5897, 2016.