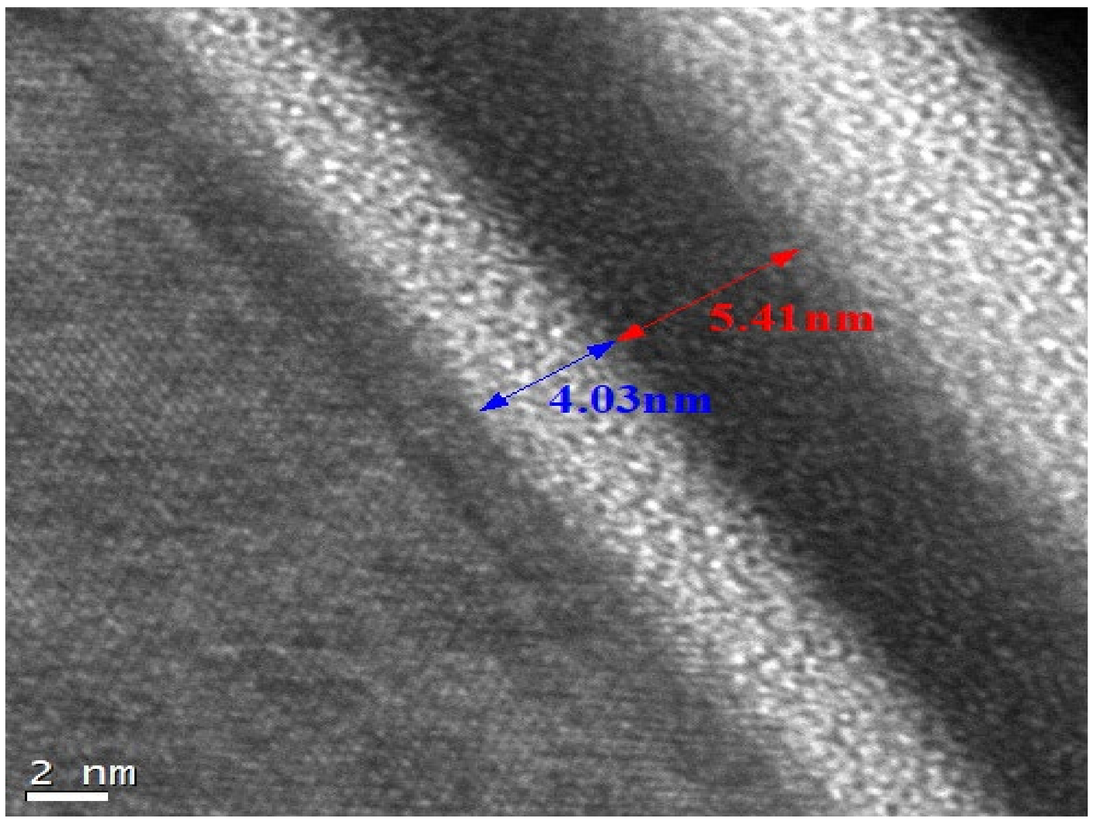
Enabling low-cost high-efficiency solar cells using nano-scale atomic layer deposited films

School of Photovoltaic and Renewable Energy Engineering

ATOMIC SCALE ENGINEERING OF THIN FILMS

We have the capabilities to grow ultrathin films using atomic layer deposition (ALD). We have extensive experience in optimising material synthesis as well as optimising thin film material stacks for specific applications.



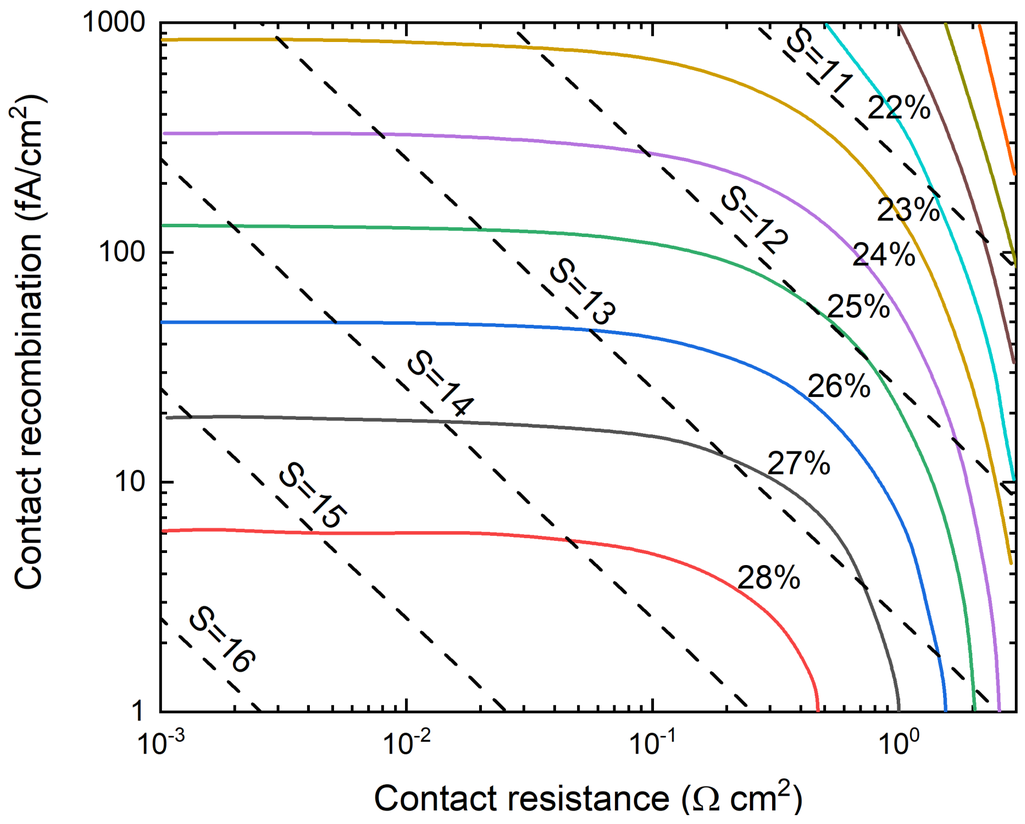
Transmission electron micrograph of a silicon oxide - molybdenum oxide stack grown by ALD. ALD can grow a wide range of materials such as dielectrics, TCOs, and metals.

COMPETITIVE ADVANTAGES

- **Ultimate control of thickness and composition** of ultrathin layers (including binary and tertiary compounds)
- **Intrinsic uniformity** over very large areas and batch sizes when process is in ALD regime
- Significantly **lower precursor usage** compared to alternative deposition technologies such as PECVD, sputtering, and thermal evaporation.
- Very **low pinhole densities** in material.
- **Bifacial deposition** is straightforward and significantly cheaper than any other deposition technique.

PASSIVATING CONTACTS

The race towards the ultimate silicon solar cell efficiency has entered its final stage empowered by *passivating contacts*. We are exploring this project with our Chinese partner Leadmicro.



Efficiency ceiling imposed by the contact properties. This graph clearly illustrates that higher selective contacts are required to achieve maximum solar cell efficiencies (graph adapted from Brendel et al., IEEE JPV, 2016)

OUR EXPERTS & INFRASTRUCTURE

We currently have a 20 person research group working on computational material science, material synthesis, material analysis, device optimisation and integration. Experimental work is conducted at single sample as well as full-industrial scale in our batch reactor in the Solar Industrial Research Facility (SIRF) at the UNSW Sydney Campus.

新南威尔士大学火炬创新园区
Torch Innovation Precinct at UNSW

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