

Boron concentration measurements at the i/p interface in nip a-Si solar cells

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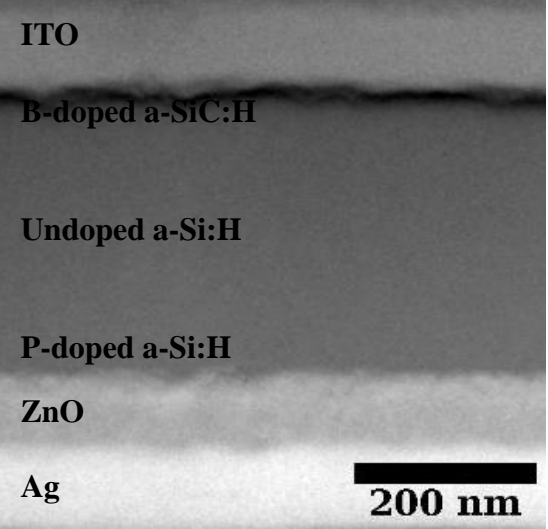
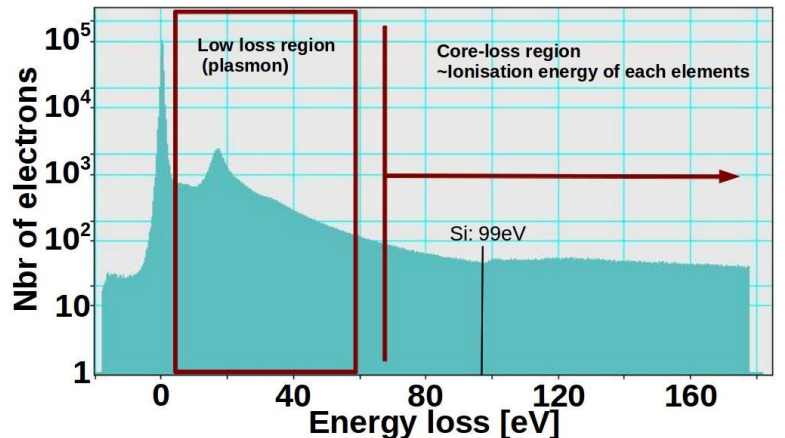
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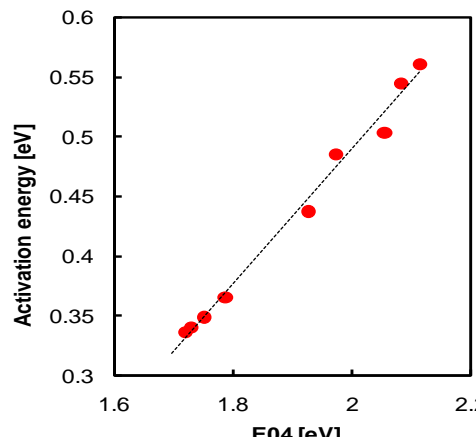
Summary and Conclusions

- Optical E_g and E_{act} are controlled by varying the B_2H_6 and CH_4 flow
- Model calculations show optimum E_g p-layer $\geq E_g$ i-layer
- Core-loss EELS detects boron-concentration as low as 10^{20} cm^{-3}
- Low loss EELS probes local variation in plasmon energy

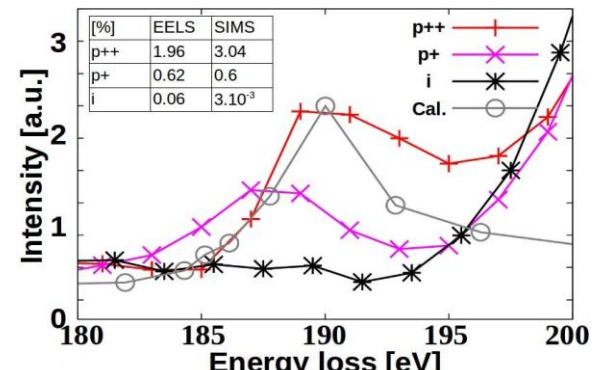
Activation energy vs. band gap of p-SiC

- Increasing the CH_4 flow and decreasing the B_2H_6 flow leads to higher E_{act} and E_{04} .
- However, the dark conductivity σ_d varies more than one order of magnitude at a given combination of E_{act} and E_{04}



Core-loss Electron Energy Loss Spectroscopy (EELS)

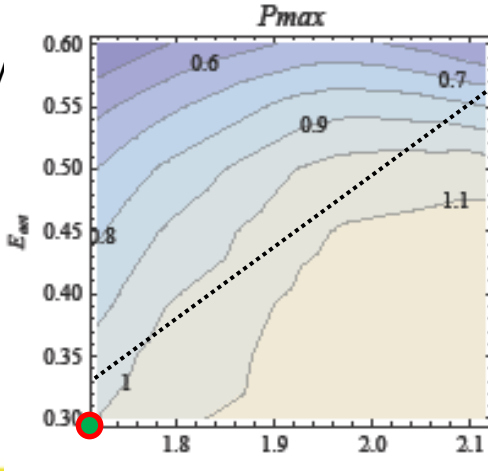
- B-peak visible in test structure after elaborate signal correction
- Sensitive enough to detect boron levels down to 10^{20} cm^{-3}
- Spatially resolved, thus applicable in solar cell stacks



[%]	EELS	SIMS
p++	1.96	3.04
p+	0.62	0.6
i	0.06	3.10^{-3}

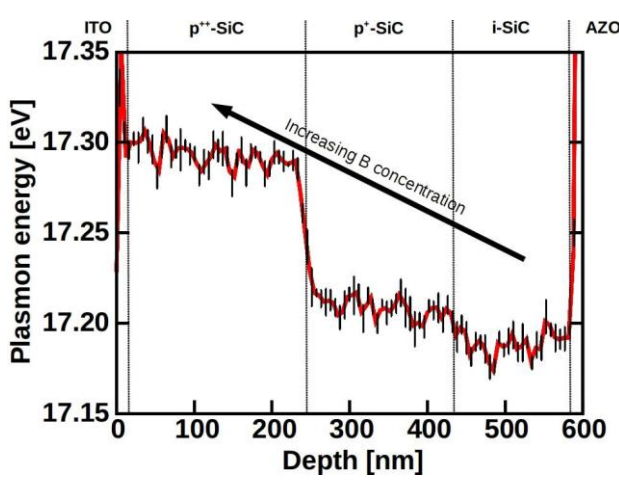
Modelled efficiency as a function of E_{act} and E_{04}

- All data points compared to $E_{act} = 0.3\text{eV} - E_{04} = 1.7\text{eV}$
- V_{oc} decreases mostly with E_{act} and some with E_{04}
- FF decreases a lot for $E_{act} > 0.5 \text{ eV}$
- J_{sc} increases with E_{04}



Plasmon energy

- Sharp increase of plasmon energy at interfaces
- Higher doping corresponds to higher E_p
- Front and back TCO have highest plasmon energy



Acknowledgements

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