Enhancing dye-sensitized solar cell performance by introducing Fe/Co into the B-site of $Sr_{0.7}Sm_{0.3}BO_{2.89}$ perovskite photoanodes

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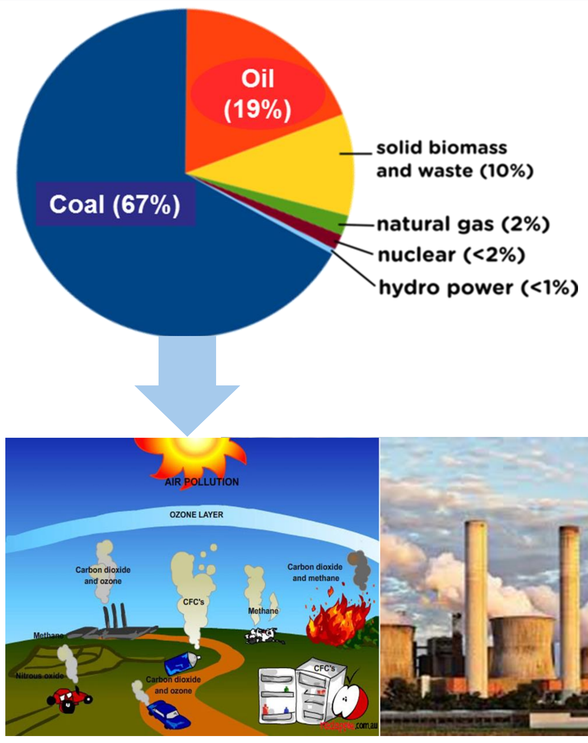
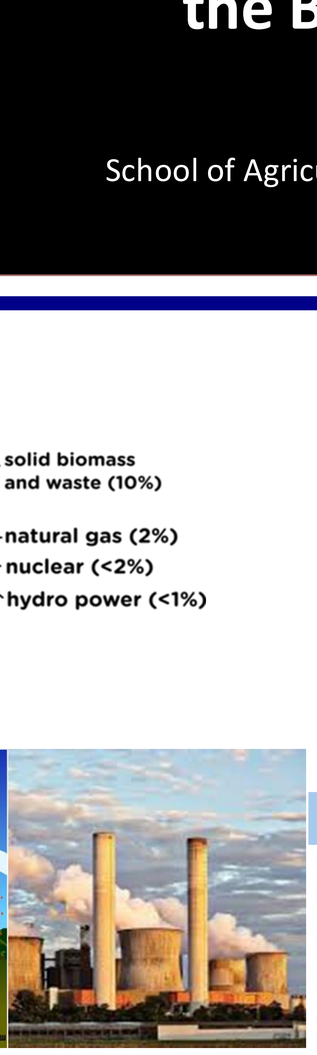
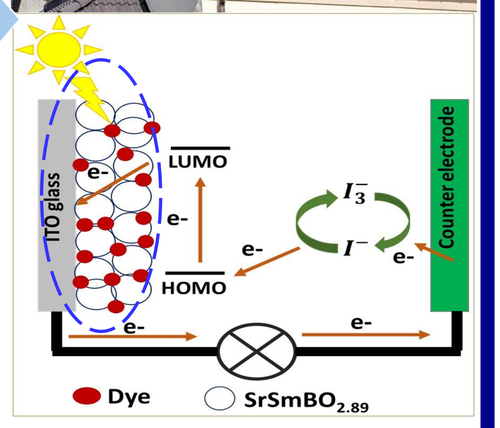
Motivation and background







Aim

- The purpose of this study is to synthesize $Sr_{0.7}Sm_{0.3}BO_{2.89}$ (B denotes Fe or Co) perovskite oxides as promising photoanodes in DSSCs

Experimental

Mixture of various metals acetylacetonates
Metals ((Sr, Sm, Fe/Co)

Ball-milled for 5 hrs
Operating at 350 °C

Calcined at 600 °C for 10 hrs

SSF/SSC

Testing

Solar simulator

Scheme 1: The synthesis of SSF and SSC

Results and discussion

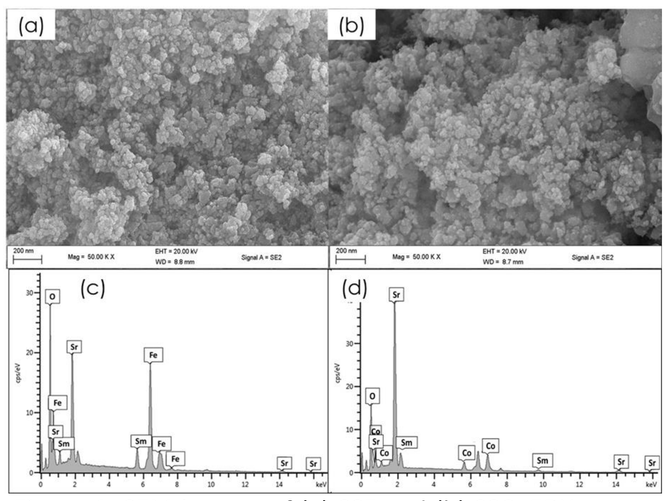


Figure 1: SEM images of (a) SSF and (b) SSC. EDX spectra of (c) SSF and (d) SSC

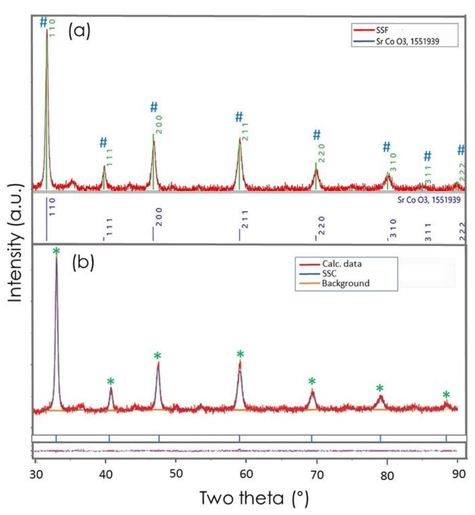


Figure 4: X-ray diffractograms for (a) SSF and(b) SSC. The symbols # and * denote $SrFeO_{2.83}$ and $SrCoO_3$, respectively

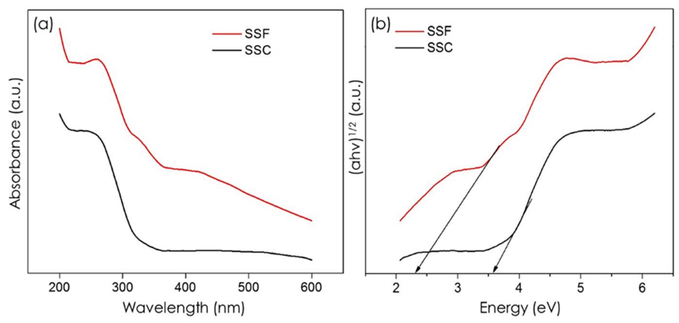


Figure 2: UV-Vis absorbance spectra, and (b) energy bandgaps

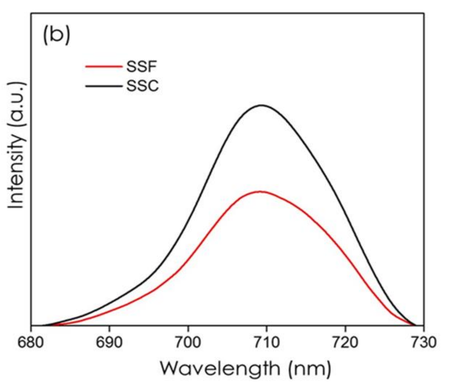


Figure 5: The photoluminescence spectra of SSF and SSC

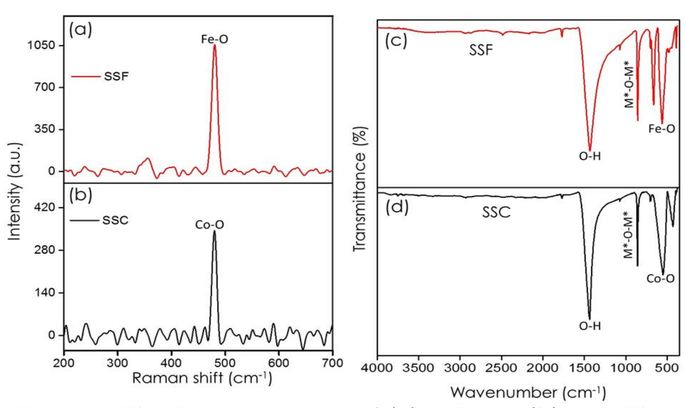


Figure 3: The Raman spectra of (a) SSF and (b) SSC. The FTIR spectra of (c) SSF and (d) SSC

Table 1: Some properties of SSF and SSC

Sample	Surface area ($m^2\ g^{-1}$)	Resistivity (Ω cm)	Conductivity ($S\ cm^{-1}$)
SSF	53	0.201	**4.98**
SSC	36	0.432	2.31

Photovoltaic measurements

Table 2: Photovoltaic parameters of SSF and SSC

Samples	V_{oc} (V) ±0.01	J_{sc} (mA cm^{-2}) ±0.20	FF (%) ±2	PCE (%) ±0.10
TiO_2 (ref)	0.49	9.95	55	4.76
SSC	0.61	4.73	48	2.98
SSF	0.61	13.33	60	**6.24**

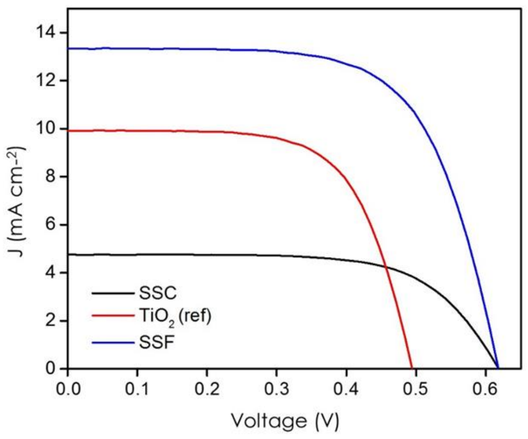


Figure 6: Photocurrent density characteristics of SSF and SSC

Conclusion

- TEM images revealed the formation of irregular-shaped nanoparticles on both SSF and SSC
- FTIR spectra confirm the formation of various functional groups
- Varying the B-site using Fe or Co significantly influenced the structure and morphology of $Sr_{0.7}Sm_{0.3}BO_{2.89}$
- SSF exhibited enhanced V_{oc} of **0.61 V**, J_{sc} of **13.33 mA cm^{-2}**, and PCE of **6.24%**

Acknowledgements

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