



Phase Pure CuBi_2O_4 with Tunable Optical Bandgaps for Photocathodes

S.F.U. Farhad^{1,2*}, **M.I. Naher**¹, N.I. Tanvir^{1,2}, M.S. Quddus², S. Islam¹, M.A.A. Shaikh³, and M. Moniruzzaman²

¹Energy Conversion and Storage Research Section, Industrial Physics Division, BCSIR Laboratories, Dhaka 1205

²Central Analytical and Research Facilities (CARF), BCSIR, Dhaka 1205

³Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka 1205, Bangladesh

E-mail: sf1878@my.bristol.ac.uk; s.f.u.farhad@bcsir.gov.bd

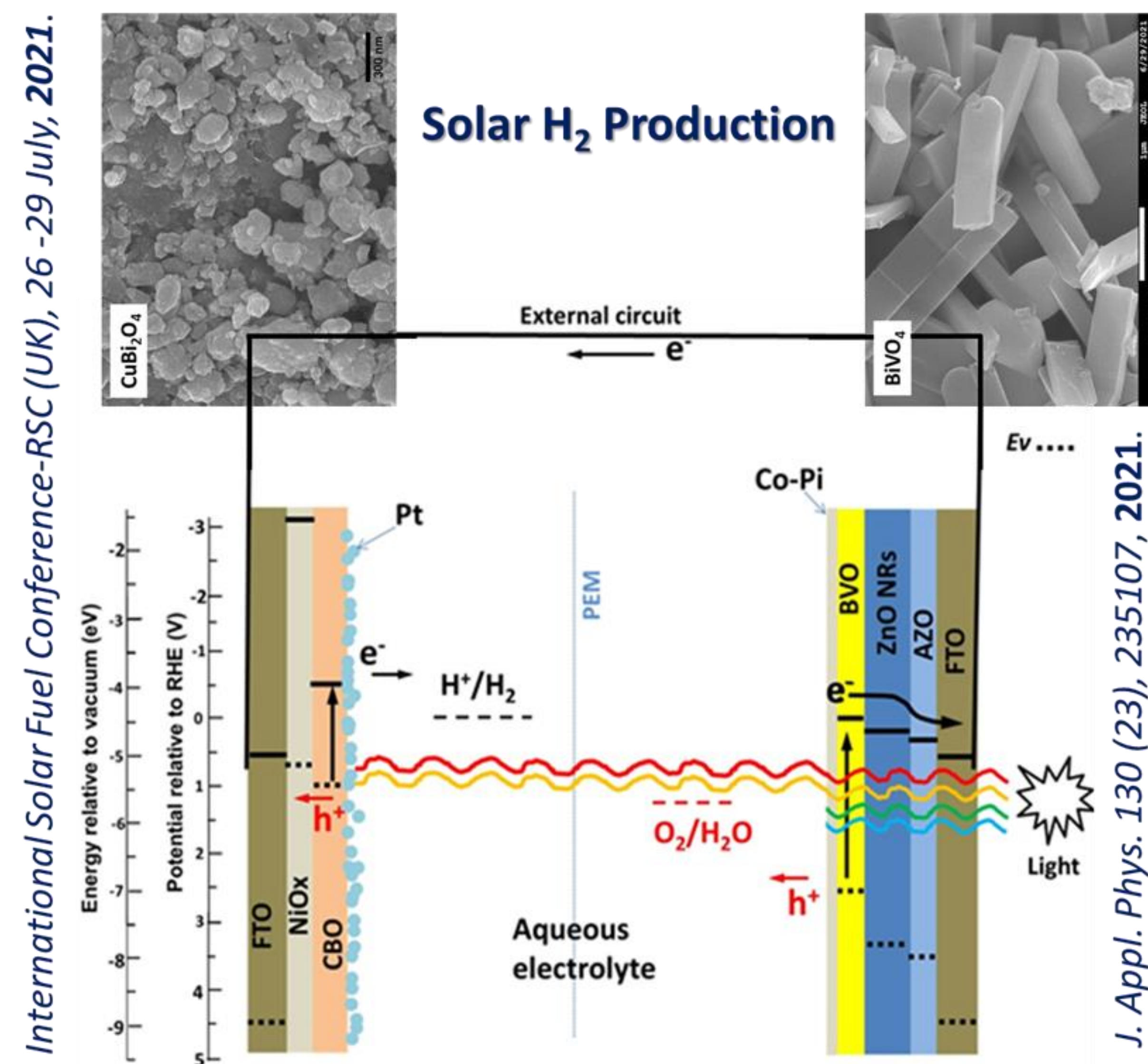


A place of innovative minds

Background

- Photoelectrochemical (PEC) devices for solar fuel (e.g., H_2)
- Bismuth-based metal oxide, such as BiVO_4 (BVO) and CuBi_2O_4 (CBO) as active photoanode and photocathode, respectively, for attaining high Solar-to-Hydrogen (STH) efficiency

Bismuth-based metal oxide photoelectrodes for self-sustained PEC device¹



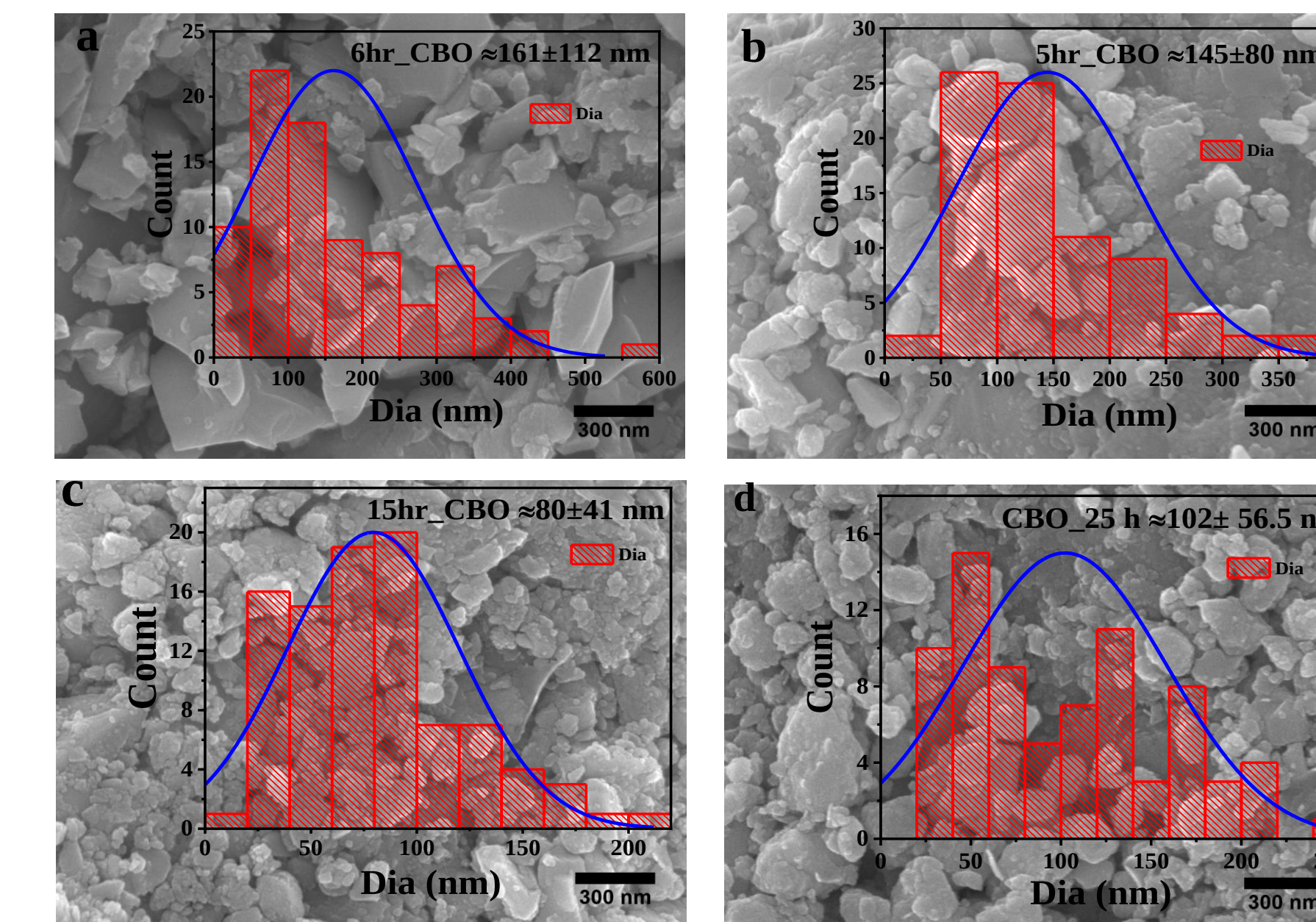
Suitability of CuBi_2O_4

- Eco-friendly
- Abundance on the earth
- Band alignment
- Durable

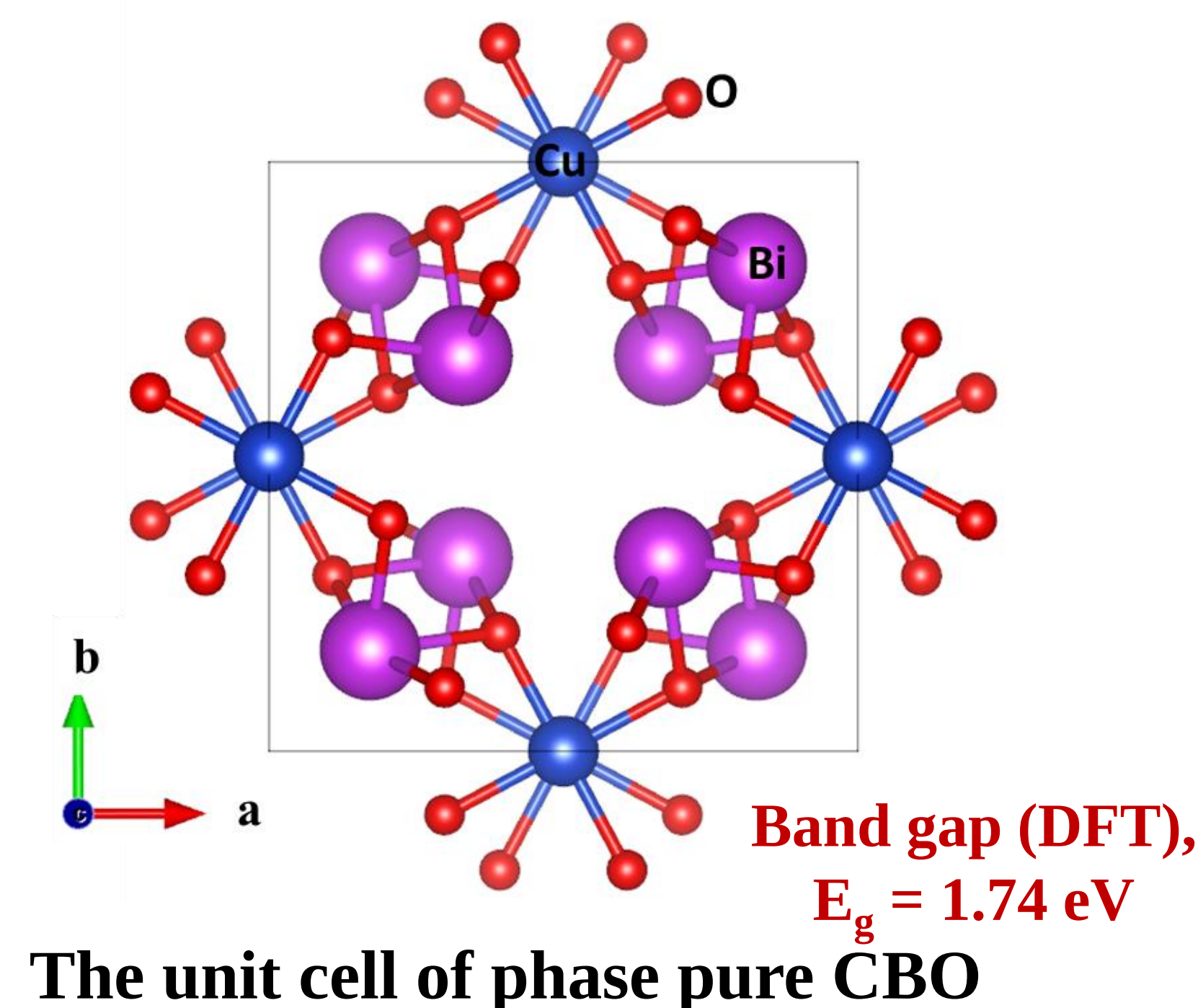
CuBi_2O_4 synthesis



Sequential Ball Milling



SEM micrographs with the corresponding grain size histograms

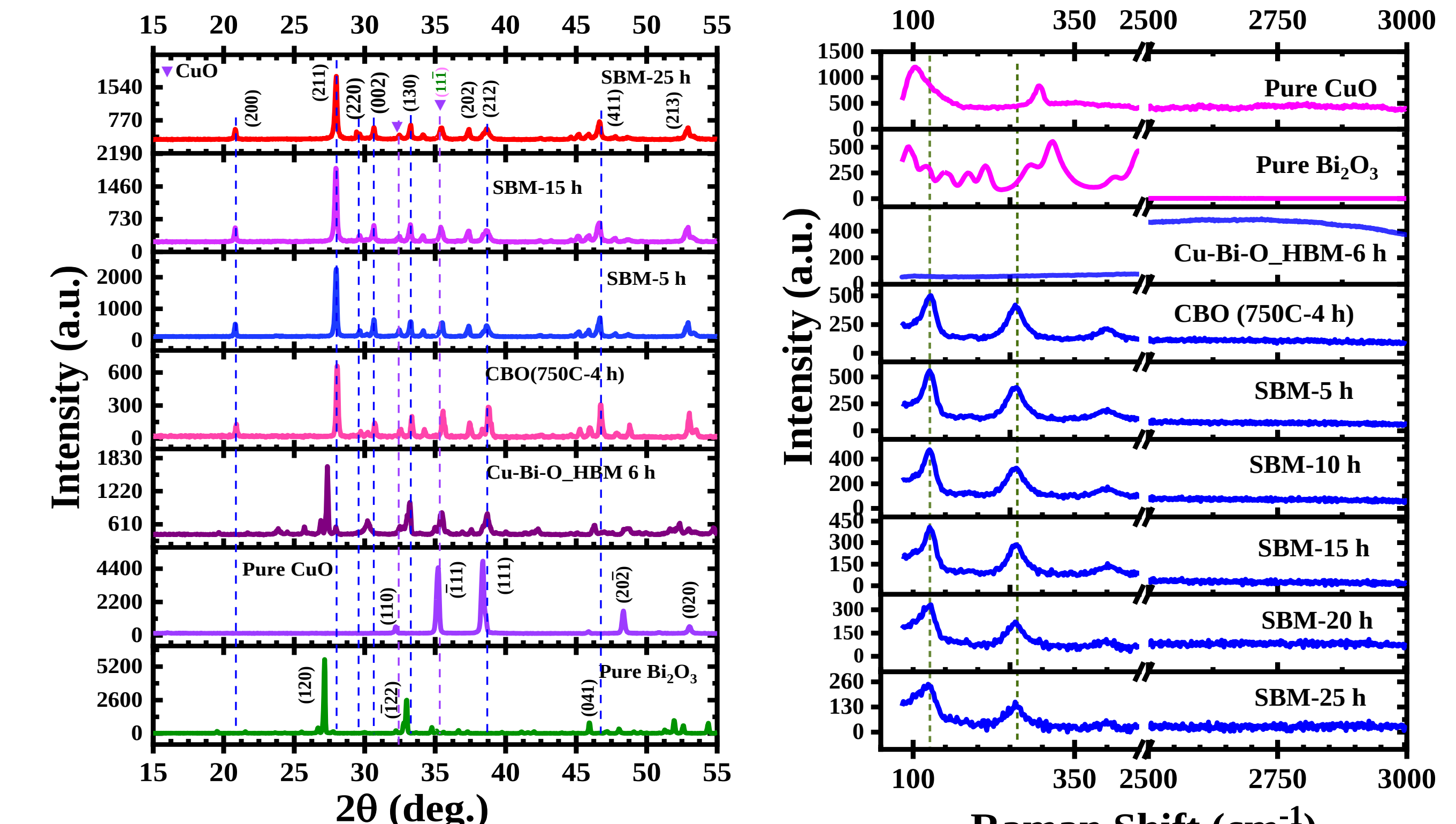


The unit cell of phase pure CBO

Conclusions

- Possibility of the presence of tiny unreacted CuO (**Beneficial?**)
- Bandgaps are direct and tunable between 1.84 to 1.74 eV
- Gradual grain size reduction with SBM duration
- Bi : Cu ratio gradually increases with SBM duration

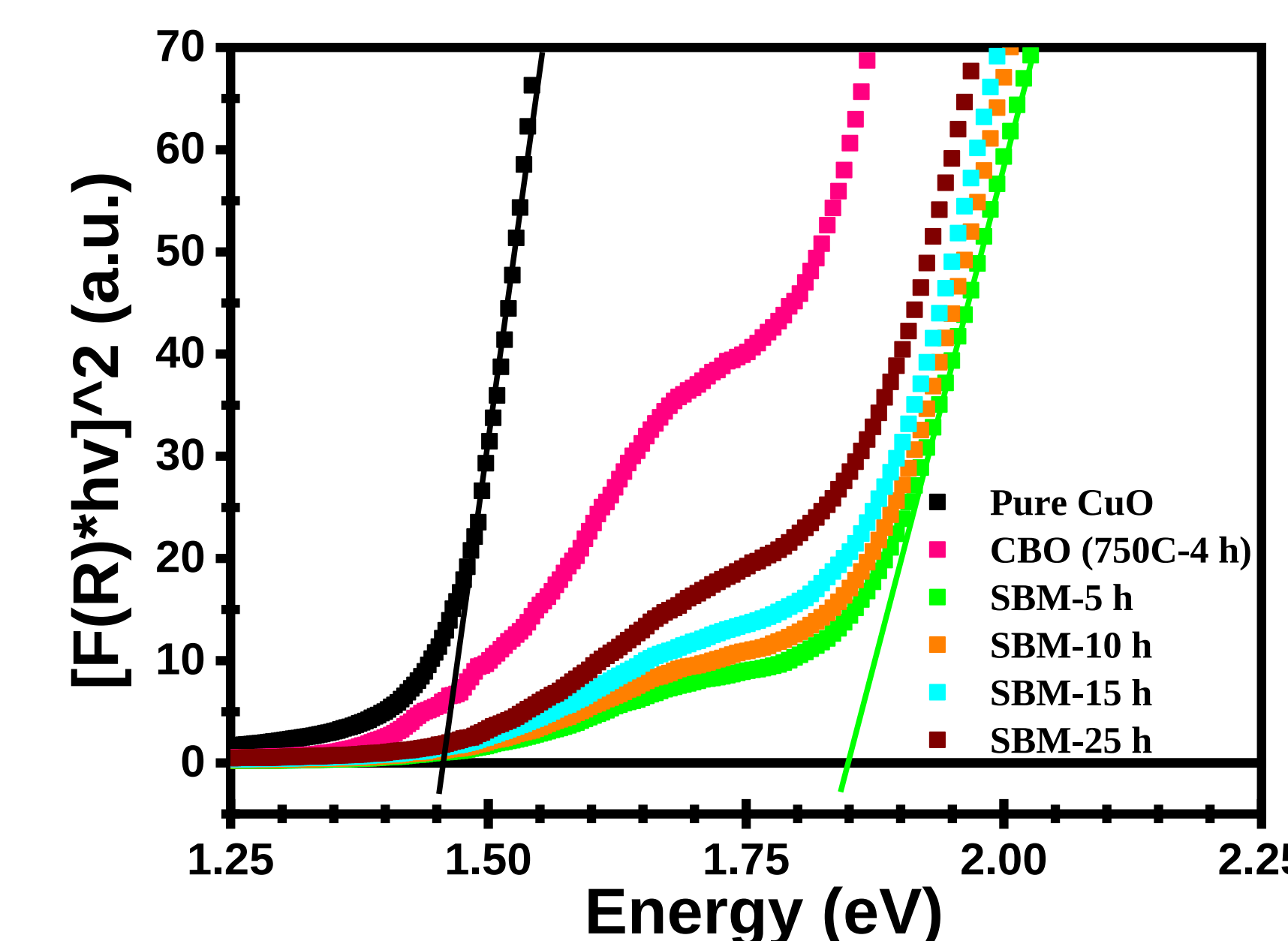
Results



XRD patterns of the samples

Raman spectra of the samples

Sample	Bi:Cu		E_g (eV)
	XPS	ICPMS	
CBO_750 °C	1.54	1.89	≈1.74
SBM-5 h	-	1.98	≈1.84
SBM-15 h	-	2.03	≈1.82
SBM-25 h	1.68	2.12	≈1.79
CBO (DFT)	2	2	1.74



Tauc plot showing optical bandgap of the samples

References

- Mend. Data, vol. 3, 2022. <https://doi.org/10.17632/b7x8khsm65.3>
- STI 2022 (IEEE); <https://doi.org/10.48550/arXiv.2209.08530>
- ACS Appl. Energy Mater., vol. 2, 2019. <https://doi.org/10.1021/acsaem.9b00297>

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