

Enhanced SnS phase purity of films produced by rapid thermal processing of SnS₂ precursors

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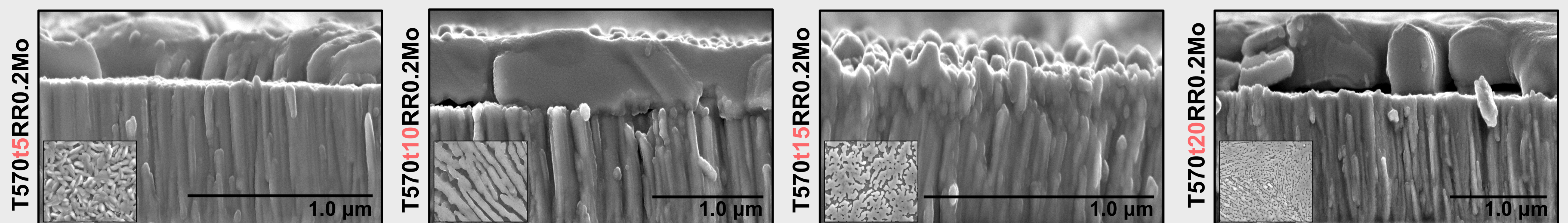
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ABSTRACT

In this work, we present a procedure to grow single phase SnS thin films consisting on the annealing of RF magnetron sputtered SnS₂ precursors. A series of samples was produced by rapid thermal processing of precursors deposited both on bare and Mo coated glass. For those samples the time at maximum temperature and heating rate were varied.

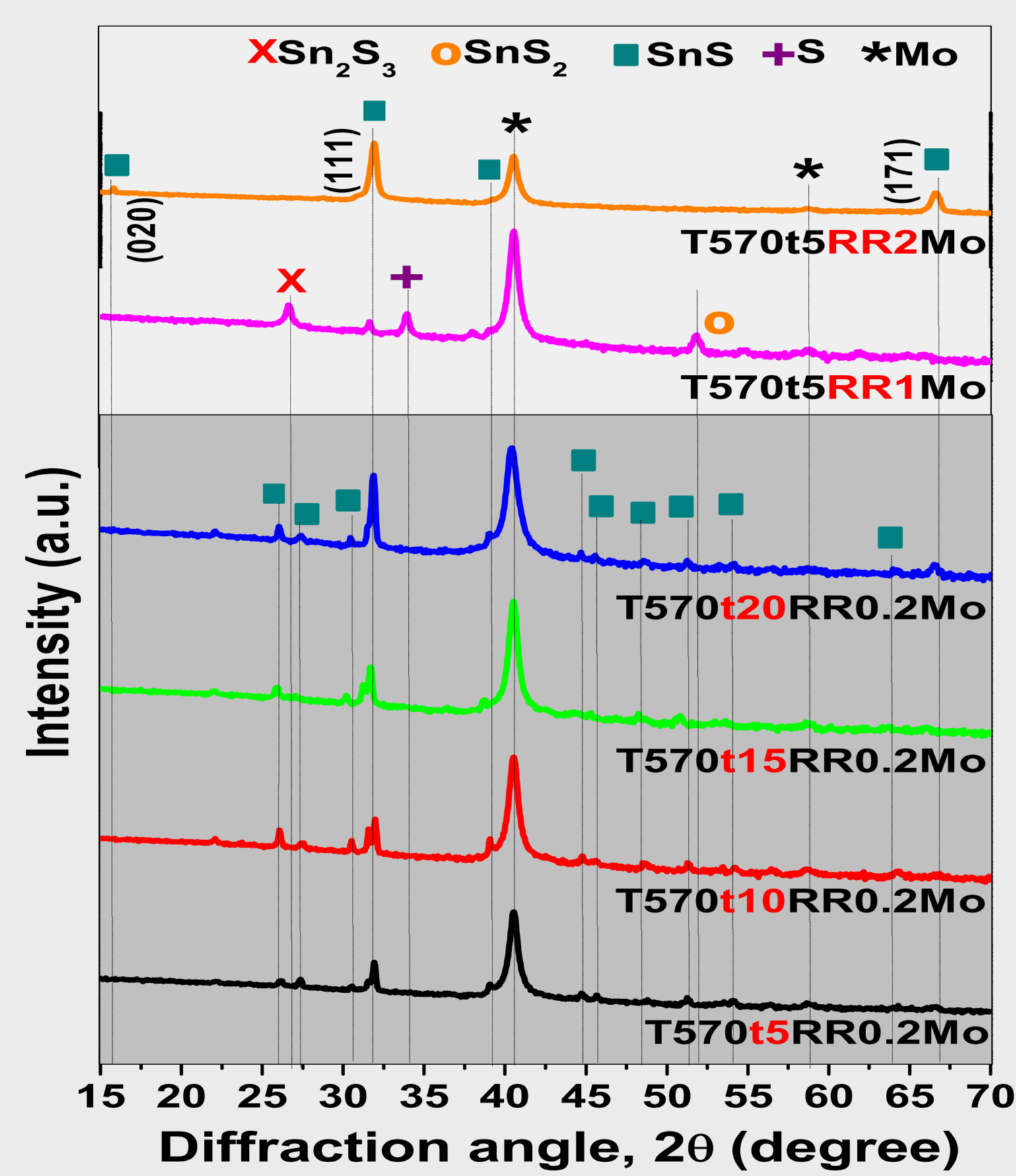
MORPHOLOGICAL

SEM/EDS Hitach SU-70 with a Rontec EDS system operated at an acceleration voltage of 4.0 KV



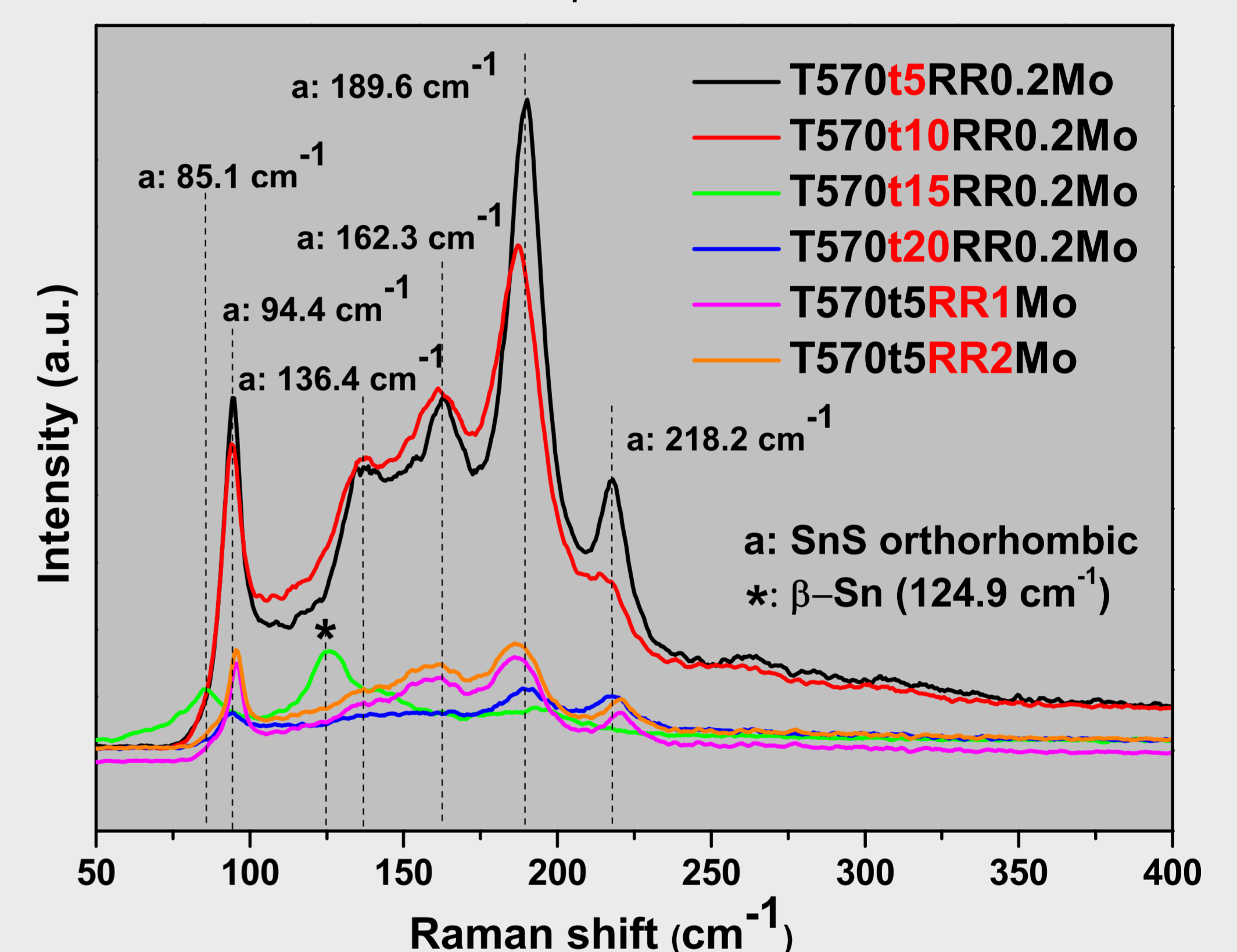
Time increase →

STRUCTURAL



The samples are composed of the orthorhombic SnS phase. The peaks are sharp which suggests that the samples have good crystalline quality.

The raman spectrum shows peaks at 94.4 cm⁻¹, 162.3 cm⁻¹, 189.6 cm⁻¹ and 218.2 cm⁻¹ which are assigned to the SnS phase.

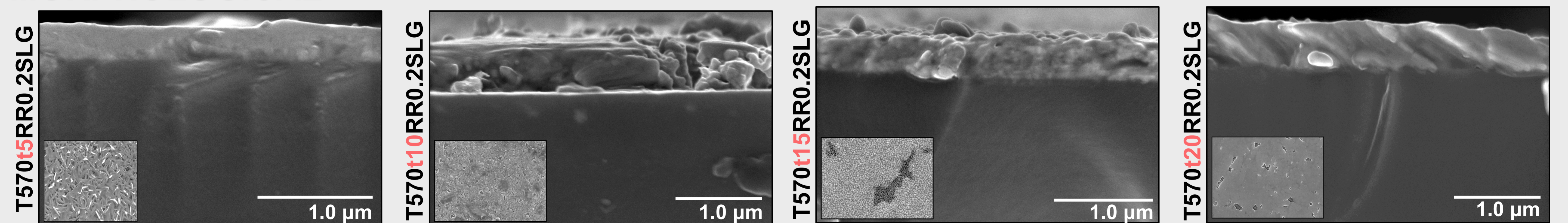


In general, SEM analysis reveals large grains.

XRD X'Pert MPD Philips PW 3710 system equipped with a CuKα source

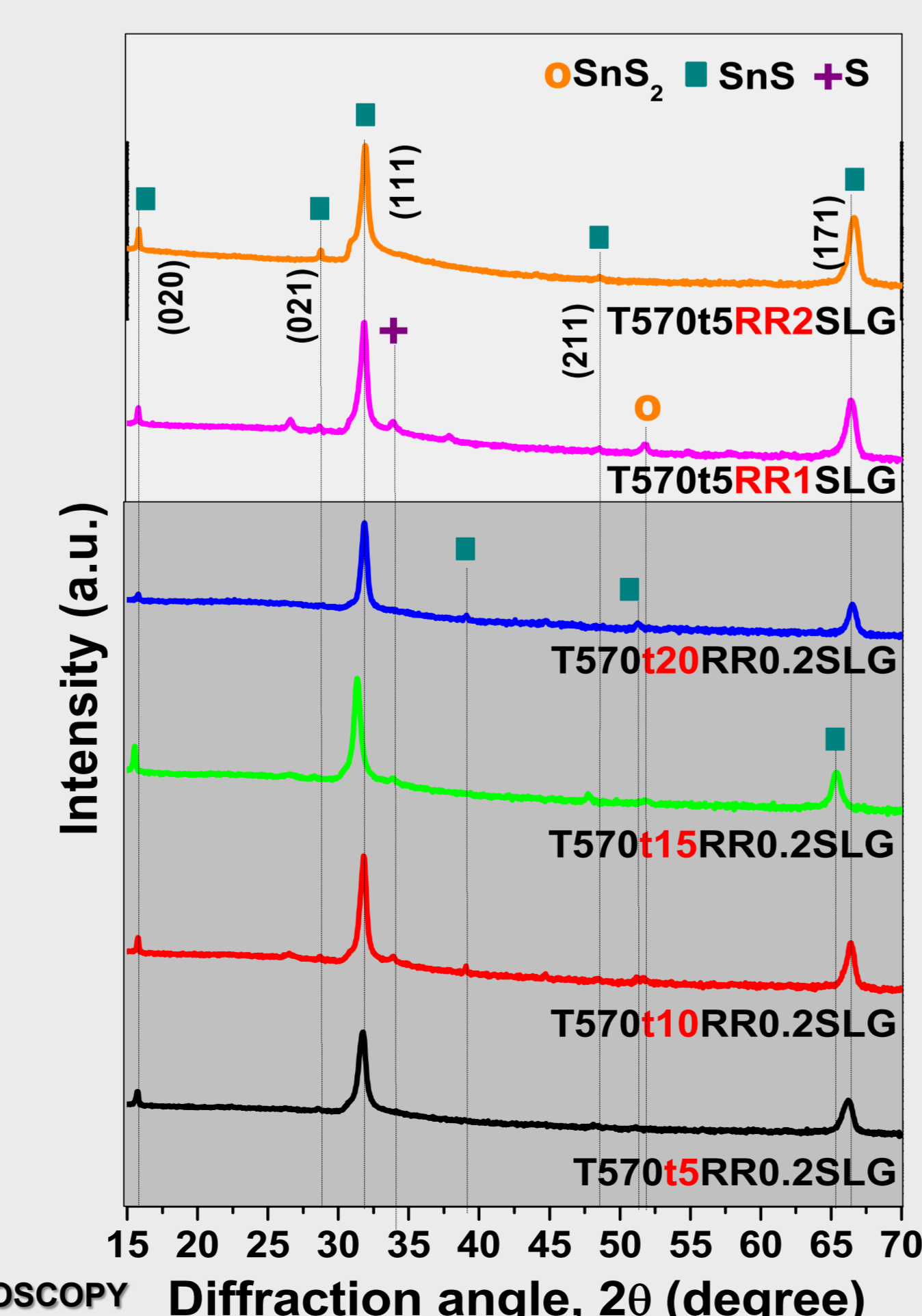
RAMAN LabRam Horiba, HR800 UV spectrometer, 532 nm excitation laser

MORPHOLOGICAL SCANNING ELECTRON MICROSCOPY

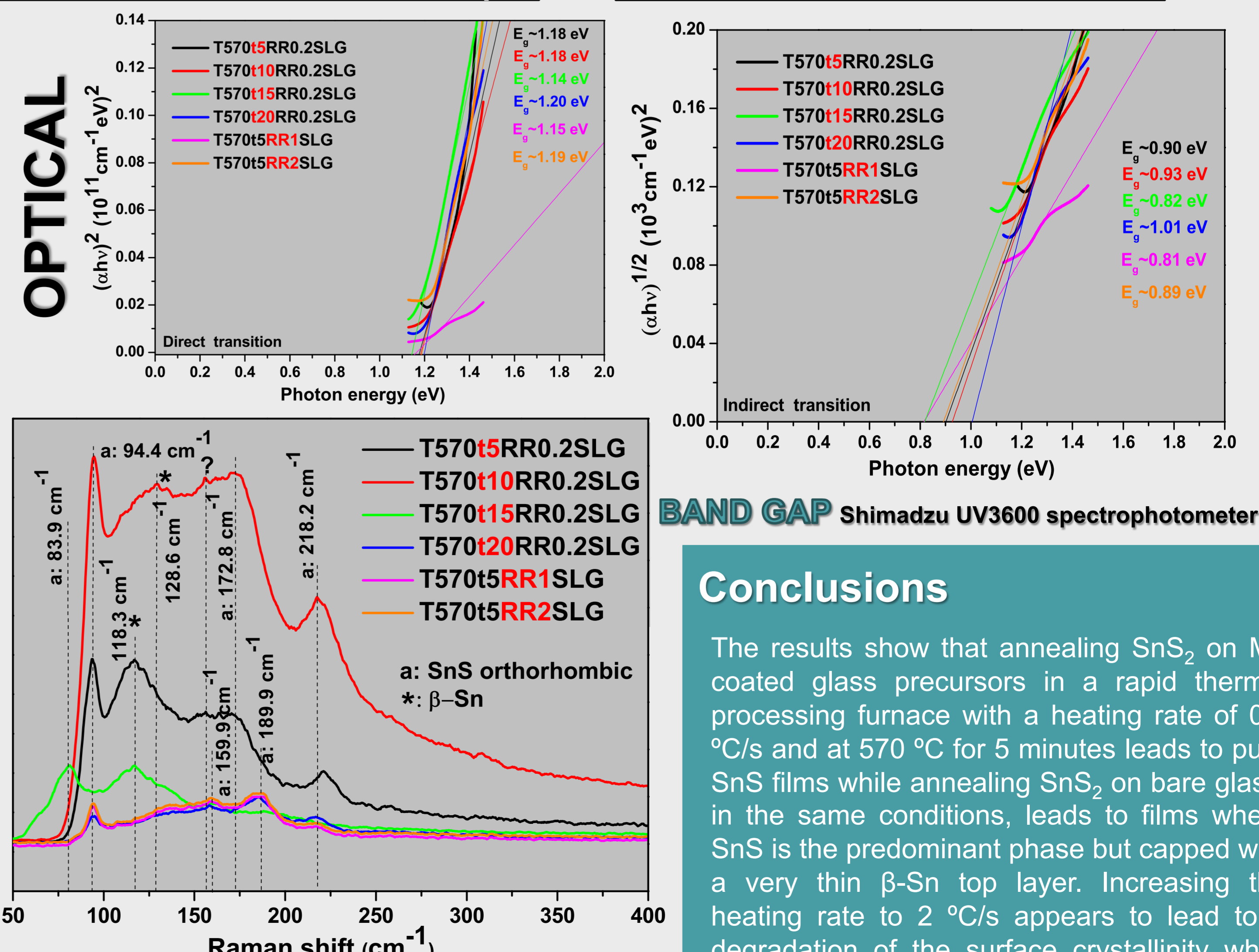


Time increase →

STRUCTURAL



OPTICAL



BAND GAP Shimadzu UV3600 spectrophotometer

Conclusions

The results show that annealing SnS₂ on Mo coated glass precursors in a rapid thermal processing furnace with a heating rate of 0.2 °C/s and at 570 °C for 5 minutes leads to pure SnS films while annealing SnS₂ on bare glass, in the same conditions, leads to films where SnS is the predominant phase but capped with a very thin β-Sn top layer. Increasing the heating rate to 2 °C/s appears to lead to a degradation of the surface crystallinity while improving the bulk.

ACKNOWLEDGMENTS

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	Sn (at.%)	S (at.%)	[Sn]/[S]
T570t5RR0.2SLG	5.60	6.41	0.87
T570t10RR0.2SLG	5.32	5.36	0.99
T570t15RR0.2SLG	7.27	5.67	1.28
T570t20RR0.2SLG	5.70	6.56	0.86
T570t5RR1SLG	4.19	5.62	0.74
T570t5RR2SLG	5.25	6.89	0.76

ENERGY DISPERSIVE X-RAY SPECTROSCOPY