

APPENDIX A

X-ray diffraction database

1. Zinc Oxide

Chemical formula: ZnO

Crystallographic parameters

Crystal system	Hexagonal
a (Å)	3.253
b (Å)	3.253
c (Å)	5.213
Alpha (°)	90
Beta (°)	90
Gamma (°)	120
Density (g/cm ³)	5.71
Volume of cell (10 ⁶ pm ³)	47.31

References

ICSD collection code: 029272

Primary reference: Calculated from ICSD using POWD (1997)

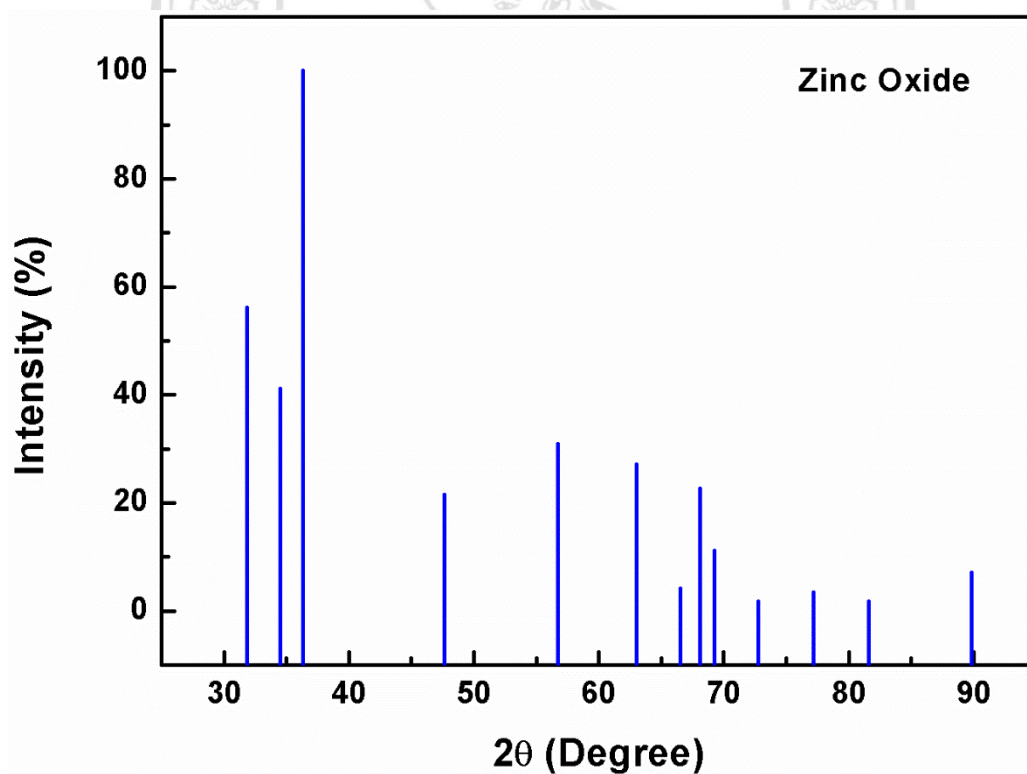
Structure: Sabine, T.M., Hogg, S., *Acta Crystallogr. Sec. B*, **25**, 2254, (1969)

Peak list

No.	h	k	l	d (Å)	2θ (degree)	Intensity (%)
1	1	0	0	2.80826	31.840	56.2
2	0	0	2	2.59740	34.503	41.2
3	1	0	1	2.47039	36.337	100.0

4	1	0	2	1.90683	47.653	21.5
5	1	1	0	1.62135	56.731	30.9
6	1	0	3	1.47393	63.015	27.2
7	2	0	0	1.40413	66.541	4.1
8	1	1	2	1.37538	68.120	22.7
9	2	0	1	1.35549	69.260	11.2
10	0	0	4	1.29870	72.759	1.8
11	2	0	2	1.23520	77.162	3.5
12	1	0	4	1.17875	81.610	1.8
13	2	0	3	1.09063	89.867	7.1

Stick Pattern



2. Cuprous Oxide

Chemical formula: Cu_2O

Crystallographic parameters

Crystal system	Cubic
a (Å)	4.260
b (Å)	4.260
c (Å)	4.260
Alpha (°)	90
Beta (°)	90
Gamma (°)	90
Density (g/cm^3)	6.18
Volume of cell (10^6 pm^3)	76.87

References

ICSD collection code: 026963

Primary reference: Calculated from ICSD using POWD (1997)

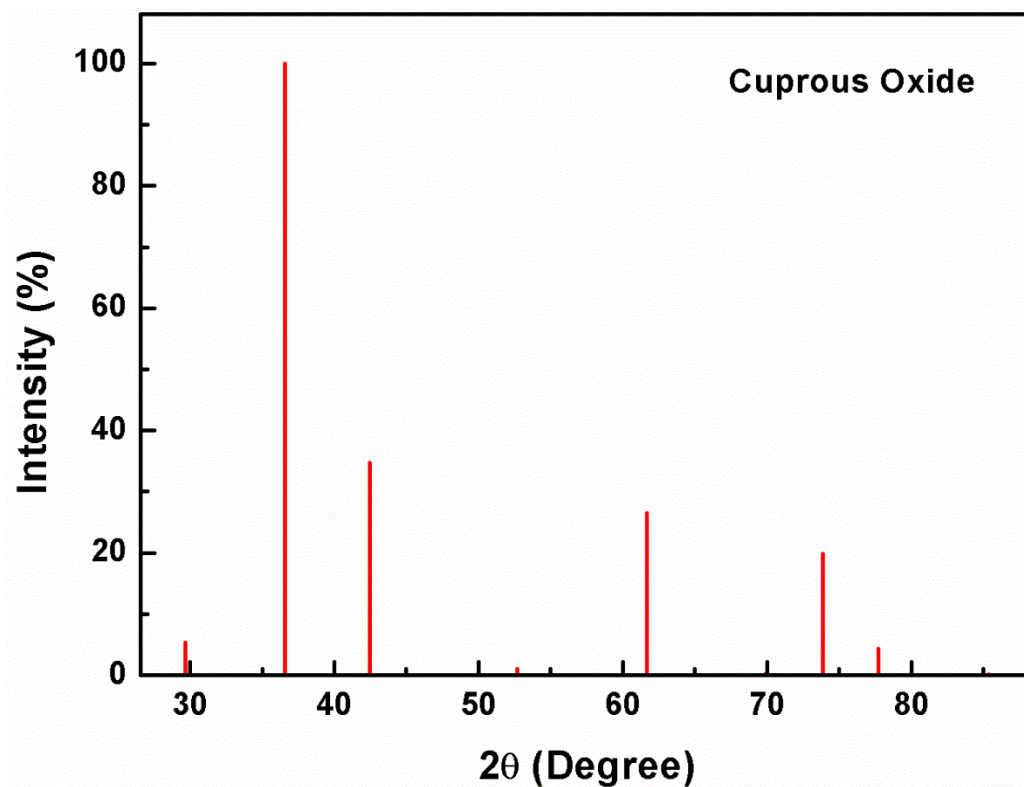
Structure: Neuburger, M. C., *Z. Phys*, **67**, 845, (1930)

Peak list

No.	h	k	l	d (Å)	2 θ (degree)	Intensity (%)
1	1	1	0	3.00662	29.689	5.4
2	1	1	1	2.45489	36.574	100.0
3	2	0	0	2.12600	42.486	34.7
4	2	1	1	1.73587	52.687	1.1
5	2	2	0	1.50331	61.648	26.6
6	2	2	1	1.41733	65.842	0.1
7	3	1	0	1.34460	69.903	0.3
8	3	1	1	1.28203	73.860	19.8

9	2	2	2	1.22745	77.740	4.3
10	3	2	1	1.13639	85.351	0.2

Stick Pattern



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3. Copper

Chemical formula: Cu

Crystallographic parameters

Crystal system	Cubic
a (Å)	3.615
b (Å)	3.615
c (Å)	3.615
Alpha (°)	90
Beta (°)	90
Gamma (°)	90
Density (g/cm ³)	8.93
Volume of cell (10 ⁶ pm ³)	47.24

References

ICSD collection code: 064699

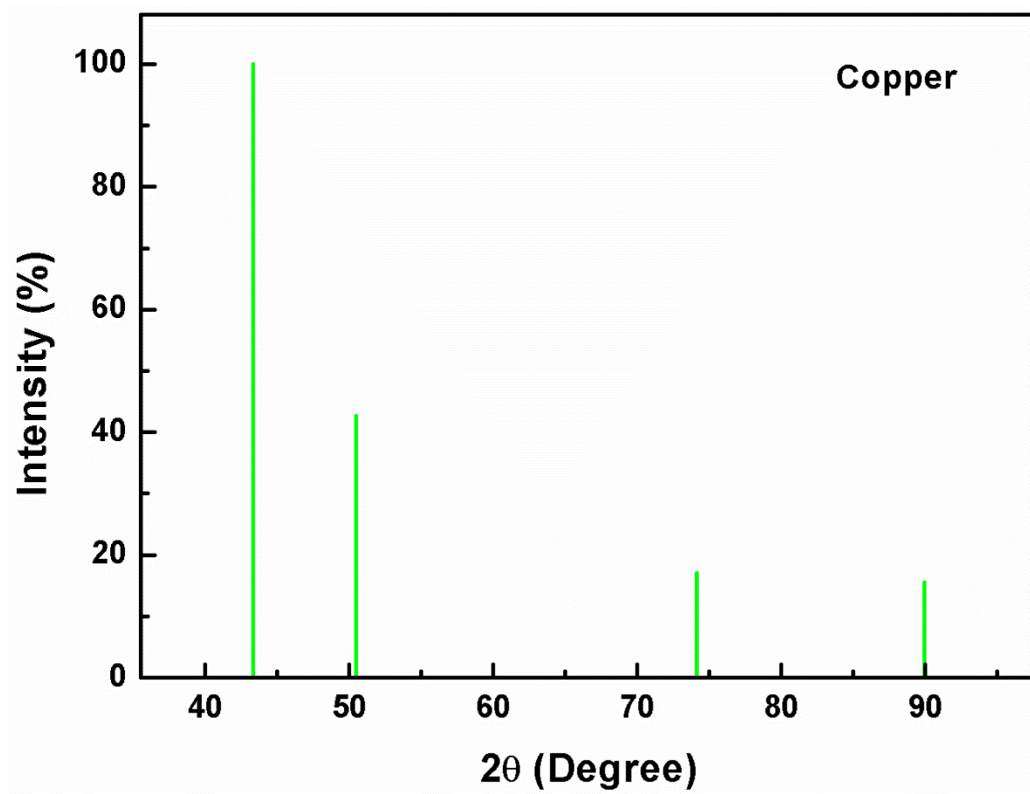
Primary reference: Calculated from ICSD using POWD (1997)

Structure: Swanson, H.E., Tatge, E., *Natl. Bur. Stand. (U.S.), Circ. 539*, **359**, 1, (1953)

Peak list

No.	h	k	l	d (Å)	2θ (degree)	Intensity (%)
1	1	1	1	2.08712	43.317	100.0
2	2	0	0	1.80750	50.449	42.7
3	2	2	0	1.27810	74.125	17.1
4	3	1	1	1.08996	89.937	15.6

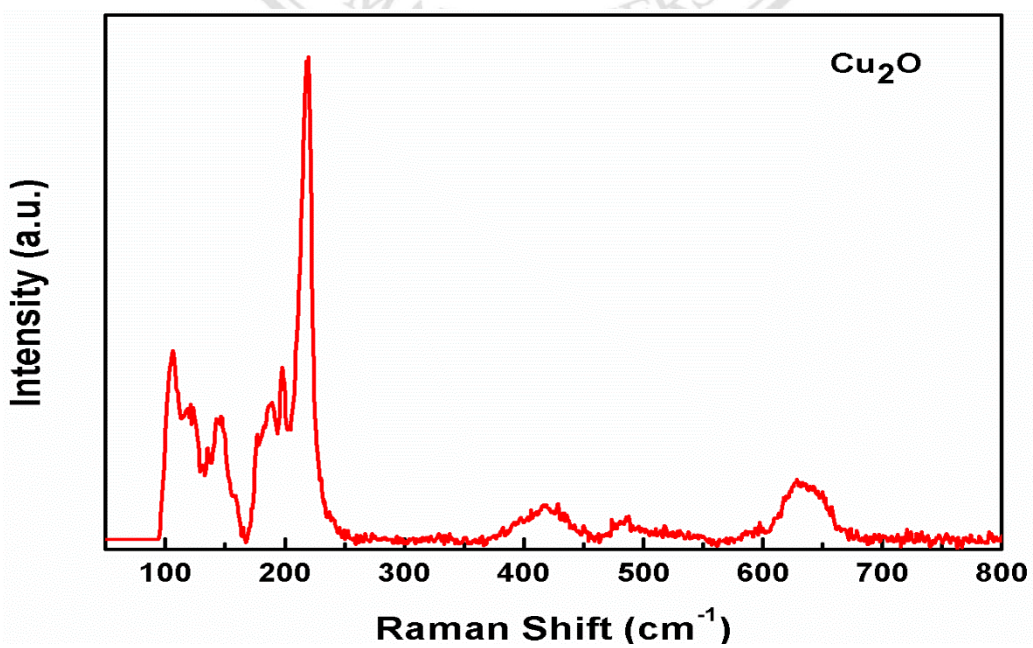
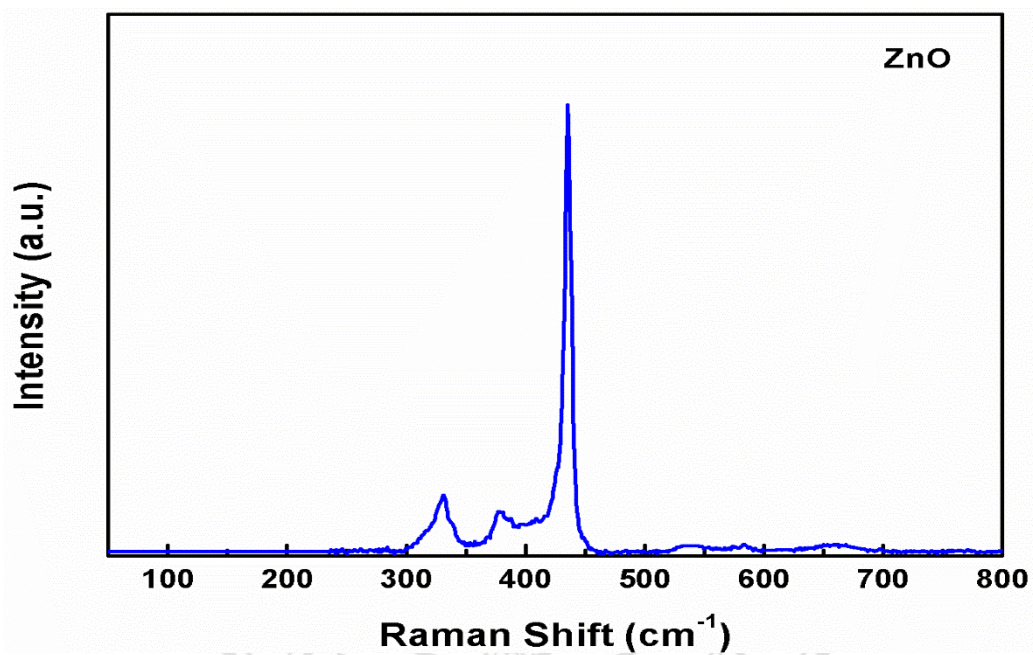
Stick Pattern

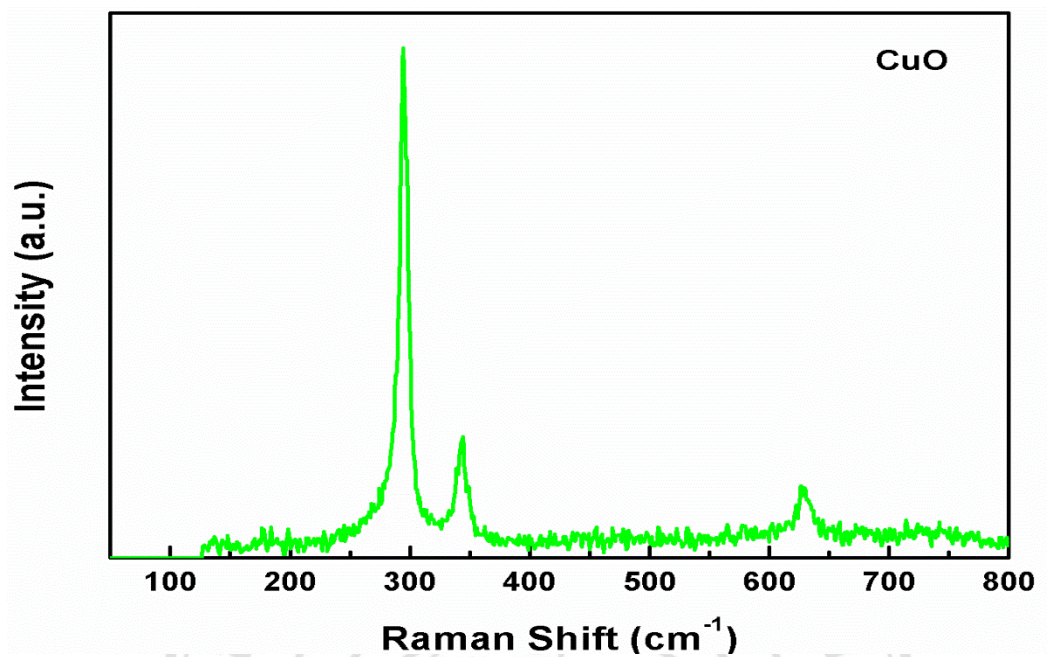


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APPENDIX B

Raman spectra database





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Conference Participations	
1.	A. Sukee, D.E. Mkrichian and S. Komonjinda, "Spectroscopy of Oscillating Algol-type star RZ Cas", The 10 th Science and Technology Conference for Youths, Kasetsart University, Thailand, June 19-20, 2015.
2.	A. Sukee, E. Kantarak and P. Singjai, "Preparation of Aluminum doped Zinc Oxide Thin Film on Glass Substrate by Sparking process and Their Optical and Electrical Properties", Siam Physics Congress 2017 (SPC2017), Rayong Marriott Resort & Spa, Rayong, Thailand, May 24-26, 2017.

