

APPENDIXES

A. Resume of the Candidate

V.N. PRAVEEN (the candidate), was born on April 9, 1977 in Cuddalore District of Tamilnadu. He has acquired B.Sc. (1997), M.Sc. (1999) and M.Phil. (2001) degrees from Bharathidasan University. He has about 7 years research experience in the field of Crystalline Materials Science and has, to his credit, 16 research papers presented in various national/international conferences and 5 research papers published (and to be published) in various refereed international journals. He has worked under the guidance of Dr. C.K. Mahadevan as a Junior Research Fellow for two years and a Senior Research Fellow for one year in a Major Research Project funded by the Department of Science and Technology, New Delhi.

B. List of Publications by the Candidate

I. In International Journals

1. **1-(4-Hydroxyphenyl)-3-phenylprop-2-en-1-one**
V. Parthasarathi, **V. N. Praveen**, S. Thamocharan, L. Vijayalakshmi
and A. Bhaskar
Acta Cryst. (2001) **E57**, 1-3
2. **Electrical Measurements on ZTS single crystals**
V. N. Praveen and C. Mahadevan
Indian J. Phys. **79**, 639 - 642
3. **Effect of impurities on the quality of ZTS Single crystals**
V.N. Praveen, N. Vijayan, C.K. Mahadevan and G. Bhagavanarayana
Materials and Manufacturing Process (under revision)
4. **Effect of impurities on the dielectric properties of ZTS single crystals**
V.N. Praveen and C.K. Mahadevan
Cryst. Res. Technol. (Communicated)
5. **Effect of impurities on the mechanical and optical properties of ZTS single crystals**
V.N. Praveen and C.K. Mahadevan
(To be communicated)

II. In National/International Conferences

1. **Electrical measurements on ZTS single crystals**
V.N. Praveen and C. Mahadevan
Ninth National Seminar on Crystal Growth, 24-26, February 2003, Crystal Growth Centre, Anna University, Chennai.(Paper No.S-48; Page58 in abstract book)
2. **Optical and dielectric measurements on glycine added ADP crystals**
C. Asokan, **V.N. Praveen**, and C. Mahadevan
Ninth National Seminar on Crystal Growth, 24-26, February 2003, Crystal Growth Centre, Anna University, Chennai.(Paper No.S-51; Page60 in abstract book)
3. **Electrical measurements of glycine added $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ and $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ single crystals**
V.N. Praveen, T. Thana Veronica, V. Sivasankari and C. Mahadevan.
XXXIII National Seminar on Crystallography, 8-10th January 2004, National Chemical Laboratory, Pune. (Paper No.P149a; Page 262 in Abstract book)

4. **Dielectric measurements on Mg²⁺ and Ni²⁺ added ZTS single crystals**
V.N. Praveen, R. Christin Beaula, C. Suji and C. Mahadevan
 XXXIII National Seminar on Crystallography, 8-10th January 2004, National Chemical Laboratory, Pune.(Paper No.P149b; Page 263 in Abstract book)
5. **D.C. Conductivity measurements on Mg²⁺ and Ni²⁺ added ZTS single crystals**
V.N. Praveen, R. Mary Jenilla, R. Kemela Vanu Rega and C. Mahadevan
 XXXIII National Seminar on Crystallography, 8-10th January 2004, National Chemical Laboratory, Pune.(Paper No.P149b; Page 263 in Abstract book)
6. **Electrical measurements on pure and impurity added ZTS single crystals**
V.N. Praveen and C. Mahadevan
 Proceedings of International Workshop on Crystal growth and Characterization of Technologically Important Materials, February 24-28th, 2004, Crystal Growth centre, Anna University, Chennai-25 (Paper no:28; page 233 in the abstract book)
7. **FT-IR spectral Analyses of pure and doped ZTS single crystals**
V.N. Praveen, R. Sakthi Sudar Saravanan, T. Asai Thambi and C. Mahadevan
 UGC sponsored National seminar on modern Trends in Applied Spectroscopy (NAMSTAS-2004), 25-26th March-2004, Physics Section, Faculty of engineering & Technology, Annamalai University, Annamalainagar-628002 (Paper No E-1,Page 47 in Abstract book)
8. **Spectral Studies on ZTS crystals added with some impurities**
V.N. Praveen, R. Sakthi Sudar Saravanan, and C. Mahadevan
 Fourth DAE-BRNS National Laser Symposium (NLS-4), 10-13th January 2005, BARC. Mumbai.(Abstract No:122, Page 384 in Abstract Book)
9. **Lattice variation and thermal parameters of ZTS crystals added with urea**
V.N. Praveen, R. Sakthi Sudar Saravanan and C. Mahadevan
 Tenth National Seminar on Crystal Growth, January 27-29th 2005, Kongu Engineering College, Erode-52.(Abstract No:73, Page 73 in Abstract book)
10. **Lattice Variation and thermal parameters of ZTC crystals added with urea.**
V.N. Praveen, R. Sakthi Sudar Saravanan and C. Mahadevan
 Symposium on Nonlinear Optical Crystals and Modeling in Crystal Growth, 28 February-1 March 2005, Dept. of Physics, Anna University, Chennai-25
11. **Studies on the growth and characterization of pure and doped ZTS single crystals**
V.N. Praveen, C. Mahadevan, N. Vijayan and G. Bhagavanarayana
 11th National Seminar on Crystal Growth (NSCG-11), 7-9, December 2006, Centre for Crystal Growth, SSN College of Engineering, SSN Nagar – 603110, Tamil Nadu, India.

12. **Lattice and thermal parameters of ZTS single crystals added with some divalent impurities**
V.N. Praveen, R. Sakthi Sudar Saravanan and C.K. Mahadevan
18th Annual General Meeting Materials Research Society of India (MRSI), February 12-14, 2007, National Physical Laboratory, New Delhi. (Page 216 in Abstract book)
13. **Growth and characterization of L-Histidine trifluoroacetate single crystals**
S.L. Rayar, V.N. Praveen, T.H. Freeda and G. Selvarajan
18th Annual General Meeting Materials Research Society of India (MRSI), February 12-14, 2007, National Physical Laboratory, New Delhi. (Page 160 in Abstract book)
14. **Synthesis and characterization of Cd_{1-x}Zn_xS nanoparticles**
R. Sakthi Sudar Saravanan, V.N. Praveen, M. Priya and C.K. Mahadevan
18th Annual General Meeting Materials Research Society of India (MRSI), February 12-14, 2007, National Physical Laboratory, New Delhi. (Page 64 in Abstract book)
15. **Studies on the optical and mechanical behavior of pure and doped ZTS single crystals**
V.N. Praveen, N. Vijayan and C.K. Mahadevan
UGC-sponsored Regional Seminar on Crystal Growth and Nanoscience, 30th August-1st September, Adithanar College of Arts and Science, Tiruchendur. (Page 52 in Abstract book).
16. **Studies on the electrical , mechanical, structural and optical properties of pure and doped Zinc thiourea sulphate (ZTS) single crystals**
V.N. Praveen, R. Sakthi Sudar Saravanan and C. Mahadevan
12th National Seminar on Crystal Growth (NSCG-11), 21-23, December 2007, Centre for Crystal Growth, SSN College of Engineering, SSN Nagar – 603110, Tamil Nadu, India.

C. Indexed X-ray Diffraction Data

Table-AC1: Indexed XRD intensity data for pure ZTS

2θ ($^{\circ}$)	d (\AA)	$I_c=I/I_0$	hkl
11.2718	7.8435	22	002
13.6415	6.4858	12	110
14.8866	5.9446	46	111
15.8276	5.5946	65	200
16.7791	5.2794	26	201
17.8687	4.9599	46	112
19.4523	4.5595	16	210
20.3044	4.3701	100	211
22.0142	4.0344	52	113
22.6119	3.9290	13	212
25.5227	3.4872	19	022
26.0186	3.4218	30	213
26.8996	3.3117	6	114
27.8323	3.2028	20	220
28.4106	3.1389	13	221
29.6910	3.0064	56	123
32.8517	2.7240	19	401
33.9568	2.6378	6	410
34.5329	2.5951	6	411
35.1897	2.5482	21	322
35.8097	2.5055	3	131
36.4188	2.4650	9	032
37.5471	2.3935	20	323
38.3297	2.3464	3	206
40.0177	2.2512	6	216
43.0342	2.1001	5	117
44.5681	2.0313	5	325
45.0931	2.0089	7	226
46.9179	1.9349	2	520
48.1399	1.8886	7	431
49.3799	1.8441	2	416
50.7198	1.7985	3	143
52.5515	1.7400	9	044
53.5026	1.7113	4	327
55.4440	1.6559	2	228
56.1313	1.6372	3	343
59.2699	1.5578	2	046
60.0225	1.5400	3	138
62.8382	1.4776	4	444
64.4805	1.4439	3	437
66.1307	1.4118	1	543
67.1148	1.3935	2	239
68.0811	1.3760	2	048

Table-AC2: Indexed XRD intensity data for ZU1

2θ ($^{\circ}$)	d (\AA)	$I_c=I/I_0$	hkl
11.3000	7.8033	27	002
13.4312	6.5869	14	110
14.9487	5.9215	100	111
15.7507	5.6217	35	200
16.8163	5.2678	15	201
17.9495	4.9377	36	112
19.4893	4.5509	13	210
20.3611	4.3580	53	211
22.0522	4.0275	31	113
22.7352	3.9080	14	212
23.4640	3.7883	6	203
24.2775	3.6631	9	120
26.0911	3.4125	28	213
26.9178	3.3095	42	114
27.8519	3.2006	13	220
28.4741	3.1321	26	221
29.7412	3.0014	52	123
30.2837	2.9489	15	214
31.7643	2.8147	6	313
32.9241	2.7182	54	223
35.2744	2.5423	19	322
36.4727	2.4615	15	032
37.6321	2.3882	15	323
40.0393	2.2500	14	216
40.6731	2.2164	6	324
41.9180	2.1534	5	026
43.5830	2.0749	10	405
44.6437	2.0281	22	325
45.2190	2.0036	6	415
46.8343	1.9382	15	520
48.2641	1.8841	8	018
49.2376	1.8491	5	317
51.0924	1.7862	7	218
52.6230	1.7378	8	028
53.2898	1.7176	7	128
54.5915	1.6797	6	620
57.7350	1.5455	4	605
60.0700	1.5389	5	138
63.2816	1.4683	3	540
64.7404	1.4387	1	350
68.9901	1.3601	2	635

Table-AC3: Indexed XRD intensity data for ZU2

2θ ($^{\circ}$)	d (\AA)	$I_c=I/I_0$	hkl
11.3479	7.7911	50	002
13.6777	6.4687	9	110
14.9263	5.9303	100	111
15.8315	5.5932	93	200
16.8008	5.2727	19	012
17.9026	4.9506	17	112
19.4778	4.5536	12	210
20.3559	4.3591	98	211
22.0049	4.0360	15	113
22.8405	3.8902	22	004
23.4683	3.7876	13	203
24.8657	3.5778	15	121
26.6347	3.3440	14	310
27.1890	3.2771	28	311
27.8603	3.1997	16	220
28.4251	3.1373	25	221
29.6942	3.0061	32	123
30.2218	2.9548	37	222
31.8577	2.8067	6	313
32.9178	2.7187	32	223
34.0307	2.6323	17	410
34.5929	2.5908	19	411
35.2459	2.5443	16	322
36.4550	2.4626	10	032
37.7592	2.3805	7	125
38.4159	2.3413	17	413
40.0368	2.2502	17	216
41.8839	2.1551	5	026
43.2245	2.0913	15	117
44.6457	2.0280	38	325
45.2095	2.0040	11	415
45.7600	1.9812	8	513
47.0259	1.9307	4	521
48.1426	1.8885	33	431
49.2508	1.8486	8	601
51.0076	1.7890	15	242
52.1394	1.7528	9	603
52.6007	1.7385	11	028
55.2221	1.6620	5	244
57.0379	1.6133	4	219
59.3556	1.5557	7	038
63.1922	1.4702	9	721
64.7625	1.4383	1	350
66.5773	1.4034	2	617

Table-AC4: Indexed XRD intensity data for ZU3

2θ ($^{\circ}$)	d (\AA)	$I_e=I/I_0$	hkl
11.3728	7.7741	14	010
13.6951	6.4606	14	110
15.0213	5.8930	100	111
15.9793	5.5418	11	200
16.8664	5.2523	55	201
18.4283	4.8105	8	112
19.5386	4.5396	35	210
20.3950	4.3508	57	211
22.0797	4.0225	28	113
22.6944	3.9149	8	212
23.4998	3.7826	2	203
24.9458	3.5665	2	121
25.6051	3.4761	12	014
26.1036	3.4109	18	213
27.1843	3.2777	15	311
27.8811	3.1976	14	220
28.4928	3.1300	25	221
29.7388	3.0017	28	123
30.2693	2.9503	9	214
31.8376	2.8084	4	313
32.9099	2.7193	18	223
34.0787	2.6287	12	410
34.6327	2.5879	5	006
35.2940	2.5409	15	322
36.4821	2.4608	10	032
37.6841	2.3851	6	323
40.1031	2.2466	8	421
40.7658	2.2116	12	324
41.8669	2.1559	4	026
43.5072	2.0784	7	423
44.6861	2.0263	16	325
46.8304	1.9383	4	520
48.2270	1.8854	5	431
49.2662	1.8481	5	601
50.5009	1.8057	2	136
52.1910	1.7512	12	603
54.6276	1.6787	3	620
56.3170	1.6323	2	145
57.7735	1.5945	1	408
59.3188	1.5566	2	046
61.8992	1.4978	1	238
63.1542	1.4710	1	721
65.1039	1.4316	1	351

Table-AC5: Indexed XRD intensity data for ZU4

2θ (°)	d (Å)	$I_c=I/I_0$	hkl
11.3260	7.8061	15	010
13.4217	6.5916	17	110
14.9294	5.9291	95	111
15.9013	5.5688	27	200
16.8552	5.2557	42	201
17.8693	4.9597	10	112
19.4824	4.5525	16	210
20.3432	4.3618	54	211
22.0158	4.0341	31	113
22.7394	3.9073	9	020
23.4698	3.7873	13	203
24.2801	3.6627	3	120
24.8904	3.5742	10	121
25.5635	3.4817	21	022
26.0879	3.4129	40	213
26.9525	3.3053	21	114
27.8703	3.1985	21	220
28.4619	3.1334	33	221
29.6985	3.0057	52	123
31.9195	2.8014	8	115
32.9033	2.7199	100	223
34.0645	2.6298	18	410
34.5898	2.5910	10	411
35.2461	2.5443	21	322
35.8953	2.4997	12	131
36.4726	2.4615	16	032
37.7048	2.3838	7	323
40.0169	2.2512	15	232
41.8192	2.1583	9	034
43.2762	2.0889	7	117
46.7771	1.9404	9	008
48.2213	1.8856	9	431
49.2601	1.8483	10	601
50.3437	1.8110	8	610
52.5865	1.7389	14	028
56.2483	1.6341	4	145
58.3942	1.5790	5	344
59.3517	1.5558	4	046
59.9789	1.5410	6	624
62.8269	1.4779	4	444
65.1393	1.4309	3	351
67.0652	1.3944	4	800
68.1088	1.3756	4	048
68.9012	1.3617	5	450

Table-AC6: Indexed XRD intensity data for ZU5

2θ ($^{\circ}$)	d (\AA)	$I_c=I/I_0$	hkl
11.3230	7.8081	28	010
13.6628	6.4758	10	110
14.9479	5.9218	97	111
15.9537	5.5507	20	200
16.7938	5.2748	24	201
17.9038	4.9502	19	112
19.4621	4.5572	27	210
20.3377	4.3630	100	211
22.0451	4.0288	39	113
22.6879	3.9161	17	212
23.9918	3.7061	3	120
25.5516	3.4833	23	022
26.8579	3.3168	23	114
27.8486	3.2010	14	220
28.4463	3.1321	25	221
29.7037	3.0051	73	123
31.7811	2.8133	7	313
32.8625	2.7231	26	223
34.0531	2.6306	14	410
35.2328	2.5452	43	322
36.4668	2.4625	18	032
37.6663	2.3861	8	323
39.1238	2.3005	6	315
40.0341	2.2503	13	216
40.7173	2.2141	7	324
41.8442	2.1571	6	026
43.5425	2.0768	28	405
44.6351	2.0284	19	325
46.8139	1.9390	6	520
48.1625	1.8878	12	431
49.3896	1.8437	5	416
50.3600	1.8105	5	610
52.1699	1.7518	12	603
52.6580	1.7367	5	407
55.4127	1.6567	5	532
57.9699	1.5896	2	441
59.3381	1.5562	5	046
60.1689	1.5366	2	151
61.9260	1.4972	9	238
63.1895	1.4703	2	721
64.7130	1.4393	2	518

Table-AC7: Indexed XRD intensity data for ZN1

2θ ($^{\circ}$)	d (\AA)	$I_e=I/I_0$	hkl
10.1933	8.6708	1	010
14.3404	6.1713	6	110
14.9599	5.9171	14	111
15.9087	5.5662	37	200
16.8034	5.2718	5	201
17.9197	4.9459	6	112
19.4793	4.5533	2	210
20.3400	4.3625	13	211
22.0101	4.0351	2	113
22.6667	3.9197	17	212
23.4672	3.7877	2	203
24.8763	3.5763	1	121
26.0748	3.4146	10	213
26.7417	3.3309	12	122
27.8391	3.2020	2	220
28.4558	3.1340	3	221
29.7342	3.0021	100	123
30.2592	2.9512	6	214
31.8300	2.8091	1	313
32.8776	2.7219	3	223
33.9324	2.6397	2	410
34.5820	2.5916	1	411
35.2482	2.5441	10	322
36.5137	2.4588	5	016
37.6779	2.3854	7	323
38.5272	2.3348	2	231
40.0027	2.2520	2	216
40.5409	2.2233	1	225
41.9344	2.1526	1	026
43.1961	2.0926	2	117
44.0646	2.0534	3	332
45.1438	2.0068	3	415
47.1131	1.9274	1	521
48.1055	1.8899	7	042
49.3448	1.8453	1	432
50.9664	1.7903	1	242
52.5122	1.7412	1	044
53.1412	1.7221	1	144
55.2527	1.6612	1	244
57.9475	1.5901	1	441
59.3504	1.5559	3	046
61.8043	1.4998	1	246
63.1143	1.4718	1	252
65.0322	1.4330	1	351
66.9997	1.3956	1	715

Table-AC8: Indexed XRD intensity data for ZN2

2θ (°)	d (Å)	I_e=I/I_o	hkl
11.3691	7.7766	44	010
13.6860	6.4648	12	110
15.0479	5.8827	100	111
16.0380	5.5217	23	012
16.8529	5.2565	12	201
17.8875	4.9547	5	112
19.5902	4.5277	43	202
20.4181	4.3460	46	211
22.0903	4.0206	18	113
22.7153	3.9114	68	212
25.6130	3.4751	39	014
26.7770	3.3266	17	122
27.8937	3.1959	8	220
28.4483	3.1348	52	221
29.7594	2.9996	27	123
30.2936	2.9480	12	214
31.7815	2.8133	7	313
32.9465	2.7164	29	205
34.0925	2.6277	15	410
35.2888	2.5413	24	322
36.5198	2.4584	12	016
37.8548	2.3747	9	125
38.4176	2.3412	10	413
40.1326	2.2450	30	421
40.6947	2.2153	14	324
42.0650	2.1462	5	510
43.6177	2.0734	9	405
44.6160	2.0293	18	325
48.3031	1.8826	7	018
49.6276	1.8354	13	036
50.7291	1.7981	11	611
51.8188	1.7629	11	612
52.6779	1.7361	8	407
53.3372	1.7162	8	128
54.0541	1.6951	7	417
57.9552	1.5900	10	441
60.5011	1.5290	10	052
67.1359	1.3931	8	239

Table-AC9: Indexed XRD intensity data for ZN3

2θ (°)	d (Å)	I_c=I/I_o	hkl
11.3158	7.8131	18	010
13.6817	6.4669	7	110
14.9579	5.9179	100	111
15.8128	5.5998	20	200
16.8299	5.2636	22	201
17.8846	4.9555	11	112
19.5221	4.5434	20	202
20.3561	4.3591	36	211
22.0075	4.0356	12	113
22.7473	3.9060	14	020
23.9896	3.7064	3	120
24.8995	3.5730	7	121
25.5676	3.4811	17	022
26.6179	3.3461	14	310
27.8550	3.2003	13	220
28.4347	3.1363	10	221
29.7038	3.0051	25	123
30.2312	2.9539	27	222
31.8395	2.8083	5	313
32.8583	2.7235	13	223
34.0282	2.6325	6	410
34.5600	2.5932	7	411
35.2470	2.5442	18	322
36.4499	2.4629	21	032
38.3113	2.3474	15	206
40.0825	2.2477	19	216
40.7340	2.2133	13	324
42.0648	2.1463	18	510
44.0502	2.0540	7	332
44.6402	2.0282	11	325
46.8253	1.9385	5	520
48.2638	1.8841	6	018
49.5886	1.8368	5	036
50.6194	1.8018	9	143
51.7218	1.7659	8	515
52.5819	1.7391	5	028
55.0833	1.6659	5	119
57.8501	1.5926	3	408
59.3778	1.5552	5	038
63.0043	1.4741	3	252
64.5467	1.4426	4	542
67.9249	1.3788	9	724

Table-AC10: Indexed XRD intensity data for ZN4

2θ ($^{\circ}$)	d (\AA)	$I_e=I/I_0$	hkl
11.3648	7.7795	21	010
13.4512	6.5772	11	110
15.0380	5.8865	29	111
15.9980	5.5354	12	012
16.8842	5.2468	100	201
18.0401	4.9131	5	112
19.5156	4.5449	13	202
20.3819	4.3536	51	211
22.0519	4.0275	17	113
22.7091	3.9125	23	212
23.4934	3.7836	5	203
25.5724	3.4805	22	022
26.0880	3.4129	23	213
26.6959	3.3365	6	122
27.9022	3.1949	10	204
28.4797	3.1315	14	221
28.9896	3.0775	7	312
29.7424	3.0013	33	123
30.2824	2.9490	17	214
31.8236	2.8096	5	313
32.9348	2.7173	59	205
34.0294	2.6324	14	410
34.6113	2.5895	4	411
35.2830	2.5417	13	322
35.9393	2.4968	6	131
36.4899	2.4603	8	032
37.6556	2.3868	9	323
40.0578	2.2490	13	216
41.8202	2.1582	6	034
43.1564	2.0945	4	117
44.6625	2.0273	25	325
46.8500	1.9376	9	520
48.2084	1.8861	24	431
49.7501	1.8312	4	425
50.6583	1.8005	11	143
52.6135	1.7381	7	028
53.9812	1.6972	4	417
55.4904	1.6546	2	532
56.1672	1.6363	2	343
57.0417	1.6132	2	219
59.3673	1.5555	3	038
60.8630	1.5208	4	229
62.5221	1.4843	2	632
66.2344	1.4099	3	626

Table-AC11: Indexed XRD intensity data for ZN5

2θ (°)	d (Å)	I_e=I/I_o	hkl
11.3706	7.7755	19	010
13.4593	6.5732	12	110
14.9468	5.9222	100	111
15.9745	5.5435	5	200
16.8220	5.2660	36	201
17.8983	4.9517	42	112
19.4808	4.5529	19	210
20.3120	4.3684	48	211
22.0412	4.0295	25	113
22.8144	3.8946	4	004
24.4901	3.6318	1	120
25.5408	3.4847	9	022
26.0617	3.4163	9	213
26.7239	3.3331	13	122
27.8306	3.2030	5	220
28.3986	3.1402	10	221
28.9112	3.0857	11	312
29.7177	3.0038	38	123
31.8296	2.8091	2	313
32.8630	2.7231	8	223
34.0265	2.6326	14	410
34.5578	2.5920	6	411
35.2263	2.5456	10	322
36.4332	2.4640	6	032
37.5953	2.3905	15	323
38.3980	2.3424	10	413
40.0781	2.2479	12	216
41.7812	2.1602	67	034
43.2505	2.0901	4	117
44.6472	2.0299	40	325
46.7706	1.9407	5	008
48.1715	1.8875	10	431
49.2449	1.8488	5	317
49.7573	1.8310	4	425
51.0482	1.7876	3	218
52.1586	1.7522	6	603
53.8379	1.7014	3	426
55.4269	1.6563	2	532
56.2585	1.6338	1	145
60.1371	1.5374	12	151
61.5762	1.5049	1	631
66.1133	1.4122	1	543
68.1900	1.3741	1	048

Table-AC12: Indexed XRD intensity data for ZM1

2θ ($^{\circ}$)	d (\AA)	$I_c=I/I_0$	hkl
11.3068	7.8193	48	010
13.6425	6.4854	15	110
14.9328	5.9278	100	111
15.9736	5.5438	7	200
16.8374	5.2613	38	201
17.9122	4.9479	10	112
19.4570	4.5584	20	210
20.3548	4.3593	67	211
22.0449	4.0288	38	113
22.7402	3.9072	9	020
23.4656	3.7880	10	203
25.5273	3.4865	18	022
27.1977	3.2761	18	311
27.8722	3.1983	11	220
28.9105	3.0858	26	312
29.7082	3.0047	35	123
31.8708	2.8056	32	313
32.9112	2.7172	58	223
34.5954	2.5906	7	411
35.2613	2.5432	20	322
35.9018	2.4993	11	131
36.4675	2.4618	11	032
37.5900	2.3908	15	323
38.4037	2.3420	20	413
39.1408	2.2996	6	315
40.0150	2.2513	26	232
41.8040	2.1590	33	034
43.5283	2.0774	14	423
44.6252	2.0289	51	325
46.7551	1.9413	7	008
47.2453	1.9223	4	521
48.2587	1.8843	6	018
49.5253	1.8390	11	240
50.6196	1.8018	9	143
52.6067	1.7383	6	028
55.3776	1.6577	3	228
56.2460	1.6342	6	145
58.1900	1.5841	10	245
59.3329	1.5563	5	046
64.7303	1.4389	1	518

Table-AC13: Indexed XRD intensity data for ZM2

2θ ($^{\circ}$)	d (\AA)	$I_c=I/I_0$	hkl
11.3968	7.7577	27	010
13.4582	6.5738	11	110
15.0064	5.8988	71	111
16.0235	5.5266	11	012
16.8609	5.2541	50	201
18.4597	4.8024	15	112
19.5751	4.5312	31	202
20.4046	4.3488	100	211
22.0883	4.0210	25	113
23.4924	3.7837	5	203
24.3615	3.6507	5	120
25.6131	3.4751	14	014
26.1036	3.4109	24	213
27.0131	3.2981	11	311
27.8917	3.1961	15	220
28.4830	3.1311	17	221
28.9948	3.0770	14	312
29.7685	2.9987	41	123
30.2887	2.9484	13	214
31.9018	2.8029	3	115
32.9272	2.7179	19	223
34.0480	2.6310	4	410
35.2979	2.5406	23	322
35.9142	2.4984	5	131
36.5147	2.4587	18	016
37.6921	2.3846	7	323
40.1237	2.2455	13	421
40.7674	2.2115	6	324
41.9501	2.1519	5	026
43.6435	2.0722	9	405
44.6570	2.0275	18	325
46.8529	1.9375	19	520
48.2273	1.8854	16	431
49.7096	1.8326	4	425
50.4212	1.8084	5	136
52.6527	1.7369	9	407
53.9333	1.6986	3	417
55.3718	1.6579	3	228
56.2146	1.6351	3	145
57.0483	1.6131	2	219
59.3752	1.5553	3	038
60.1576	1.5369	8	151
61.9710	1.4962	2	713
63.1140	1.4718	3	252
64.6844	1.4398	2	518

Table-AC14: Indexed XRD intensity data for ZM3

2θ ($^{\circ}$)	d (\AA)	$I_c=I/I_0$	hkl
11.3326	7.8016	25	010
13.7967	6.4132	24	110
14.9503	5.9209	86	111
15.9874	5.5391	9	200
16.8360	5.2617	28	201
17.8580	4.9628	7	112
19.5460	4.5379	32	210
20.3659	4.3570	53	211
22.0688	4.0245	35	113
23.4662	3.7879	10	203
24.3815	3.6477	4	120
25.0530	3.5515	22	022
26.0850	3.4132	65	213
27.8497	3.2008	100	220
28.4544	3.1342	13	221
29.7428	3.0013	35	123
30.2610	2.9511	15	214
31.8052	2.8112	5	313
32.9959	2.7124	12	205
34.0269	2.6326	8	410
34.5733	2.5922	14	411
35.2492	2.5440	16	322
35.9188	2.4981	10	131
36.5090	2.4591	25	016
37.6428	2.3876	6	323
38.3863	2.3430	4	413
40.0586	2.2490	27	216
41.8985	2.1544	2	026
43.3352	2.0862	3	423
44.6416	2.0282	13	325
46.8286	1.9384	3	520
48.1999	1.8864	6	431
49.7189	1.8323	6	425
50.5519	1.8040	3	143
51.1181	1.7854	3	218
52.6034	1.7384	9	028
53.1583	1.7216	7	144
54.4424	1.6839	3	531
56.1551	1.6366	2	343
58.2027	1.5838	4	245
59.3648	1.5555	19	038
63.1939	1.4702	2	721
65.1113	1.4314	2	351
66.1866	1.4108	2	543
67.1970	1.3920	2	239

Table-AC15: Indexed XRD intensity data for ZM4

2θ (°)	d (Å)	I_c=I/I_o	hkl
11.2664	7.8472	14	010
13.6449	6.4842	4	110
14.9399	5.9251	100	111
15.9313	5.5584	11	200
16.7388	5.2921	42	201
17.9118	4.9481	25	112
19.4702	4.5554	16	210
20.3009	4.3708	36	211
21.9916	4.0384	14	113
22.7079	3.9127	15	020
25.5313	3.4860	19	022
26.9166	3.3097	12	114
27.8143	3.2048	14	220
28.4330	3.1365	24	221
29.6810	3.0074	40	123
30.2284	2.9542	21	222
31.8321	2.8089	4	313
32.8814	2.7216	21	223
34.5497	2.5939	10	411
35.1950	2.5478	17	322
36.4624	2.4621	13	032
37.6048	2.3899	10	323
38.3735	2.3438	12	413
40.0261	2.2507	19	216
40.6640	2.2169	5	324
41.9064	2.1540	5	026
43.5374	2.0770	4	423
44.6276	2.0288	20	325
46.9704	1.9329	2	520
48.2058	1.8862	6	431
49.1713	1.8514	6	317
50.2822	1.8131	9	523
52.6415	1.7372	10	028
53.9970	1.6968	12	417
57.9417	1.5903	2	441
59.0886	1.5621	4	710
61.3098	1.5108	3	606
61.8965	1.4978	2	238
63.0391	1.4734	2	252
65.0612	1.4324	2	351
68.1467	1.3749	2	048

Table-AC16: Indexed XRD intensity data for ZM5

2θ ($^\circ$)	d (\AA)	$I_c=I/I_0$	hkl
11.3085	7.8181	27	010
14.9312	5.9284	68	111
15.8375	5.5911	100	200
16.8101	5.2697	21	201
18.3770	4.8238	13	112
19.4627	4.5571	27	210
20.3273	4.3652	55	211
22.0203	4.0332	23	113
22.6583	3.9211	29	212
23.4997	3.7826	14	203
24.5306	3.6259	5	121
25.5606	3.4821	48	022
26.0702	3.4152	47	213
27.1665	3.2798	25	311
27.8449	3.2014	12	220
28.4073	3.1393	14	221
28.9293	3.0838	10	312
29.6770	3.0078	33	123
30.2291	2.9541	17	222
31.8200	2.8099	4	313
32.8704	2.7225	20	223
34.0073	2.6340	9	410
35.2242	2.5458	18	322
36.4529	2.4627	11	032
37.7688	2.3799	8	125
38.3815	2.3433	7	413
40.0639	2.2487	13	216
41.8788	2.1554	3	026
43.2519	2.0901	9	117
44.6492	2.0278	31	325
47.0276	1.9307	3	521
48.1635	1.8878	23	431
49.2864	1.8473	5	601
50.3342	1.8113	18	610
51.7513	1.7650	4	515
52.5697	1.7394	7	028
55.3782	1.6577	4	228
57.8726	1.5920	4	408
59.3089	1.5569	5	046
61.9485	1.4967	3	713
63.2217	1.4696	4	721
65.0738	1.4322	3	351
66.9828	1.3959	1	715