REFFERENCES

REFERENCES

[1] **Phosphor**. (2011). Retrieved June 10, 2011, from http://en.wikipedia.org/wiki/Phosphor

[2] Glow in Dark Pigment and Glow in Dark Fabric Manufacturer from China. **Glow-in-the-dark toys**. (2009). Retrieved June 11, 2011, from http://www.ecvv.com/product/2356502.html

[3] **White light emitting diodes**. (2011). Retrieved June 11, 2011, from http://www.signlightsinc.com/Store/Store.php

[4] Silver J. (2003). **Comprehensive Coordination Chemistry II**. Greenwich University: Elsvier.

[5] **Phosphor Materials**. (2011). Retrieved June 10, 2011, from http://web.utk.edu/~prack/phosphors.html

[6] The American Heritage® Dictionary of the English Language. **Cathode-ray tube images**. (2010). Retrieved June 10, 2011, from http://images.yourdictionary.com/cathode-ray-tube

[7] **Field Emission Displays**. (2010). Retrieved June 10, 2011, from http://architecture.mit.edu/house_n/web/resources/tutorials/House_N%20Tutorial%20Display%20Technology.html

[8] Wang, S. F., Gu, F., Lu, M. K., Zou, W. G., Liu, S. W., etc. (2004). Optical properties of Ni^{2+} in ZrO_2 nanocrystals. **Optical Materials**, 27, 269–272.

[9] Liu, Y. and Claus, R. O. (1997). Blue Light Emitting Nanosized TiO_2 Colloids. **Journal of American Chemistry Society**, 119, 5273-5274.

[10] Du, Y., Zhang, M. S., Shen, Y., Chen, Q. and Yin, Z. (2003). Structural and optical properties of nanophase zinc oxide. **Applied Physics A**, A 76, 171-176.

[11] Nogami, M., Enomoto, T. and Hayakawa, T. (2002). Enhanced fluorescence of Eu^{3+} induced by energy transfer from nanosized SnO_2 crystals in glass. **Journal of Luminescence**, 97, 147–152.

[12] Garcia-Hipolito, M., Falcony, C., Aguilar-Frutis, M. A. and Azorın- Nieto, J. (2001). Synthesis and characterization of luminescent ZrO_2: Mn, Cl powders. **Applied Physics Letters**, 79, 26-28.

[13] Reisfeld, R., Zelner, M. and Patral, A. (2000). Fluorescence study of zirconia films doped by Eu, Tb and Sm and their comparison with silica films. **Journal of Alloys Compounds**, 300 –301, 147 –151.

[14] Zhang, H., Fu, X., Niu, S. and Xin, Q. (2008). Blue emission of ZrO_2: Tm nanocrystals with different crystal structure under UV excitation. **Journal of Non-Crystalline Solids**, 354, 1559–1563.

[15] Gu, F., Wang, S. F., Lu, M. K., Zhou, G. J., Liu, S. W., Xu, D., et al. (2003). Effect of Dy^{3+} doping and calcinations on the luminescence of ZrO_2 nanoparticles. **Chemical Physics Letters**, 380, 185–189.

[16] Moon, B. K., Kwon, M., Jeong, J. H., Kim, C.-S., Yi, S.-S., Kim, P. S., Choi, H. and Kim, J. H. (2007). Synthesis and luminescence characteristics of Eu^{3+}-doped ZrO_2 nanoparticles. **Journal of Luminescence**, 122–123, 855–857.

[17] **Introduction to ratiometric lanthanide sensors**. (2011). Retrieved June 11, 2011, from http://www.fscanltd.com/2.html

[18] Reisfeld, R. (2002). Rare earth complexes in sol-gel glasses. **Materials Science**, 20 (2), 5-18.

[19] Guokui, L. and Bernard, J. (2005) Spectroscopic Properties of Rare Earths in Optical Materials. **Electronic energy level structure**. Retrieved June 11, 2011, from http://books.google.co.th/books?id=HDleGQrKuEgC&pg=PA1&dq=4fN+electronic+configuration&hl=th&ei=qn2TfLABcnTrQe56vWFCA&sa=X&oi=bookresult&ct=result&resnum=10&ved=0CFoQ6AEwCQ#v=onepage&q=4fN%20electronic%20configuration&f=false

[20] Chambers, M. D. and Clake, D. R. (2006). Effect of long term, high temperature aging on luminescence from Eu-doped YSZ thermal barrier coatings. **Surface & Coatings Technology**, 201, 3942–3946.

[21] Manoharana, S. S., Goyala, S., Raoa, M. L., Nairb, M. S. and Pradhanb, A. (2001). Microwave synthesis and characterization of doped ZnS based phosphor materials. **Materials Research Bulletin**, 36, 1039–1047.

[23] Atkin, P., Overton, T., Rourke, J., Weller, M. and Arnstrong, F. (2010). **Inorganic Chemistry** (5^{th} ed). Italy: Oxford University Press.

[24] Yu, L., Liu, H., Nogami, M. (2010). The affects of doping Eu^{3+} on structures and morphology of ZrO_2 nanocrystals. **Optical Materials**, 32, 1139–1141.

[25] Djurado, E. and Meunier, E. (1998). Synthesis of Doped and Undoped Nanopowders of Tetragonal Polycrystalline Zirconia (TPZ) by Spray-Pyrolysis. **Journal of solid state chemistry**, 141, 191-198.

[26] Chen, L., Liu, Y. and Li, Y. (2004). Preparation and characterization of ZrO_2:Eu^{3+} phosphors. **Journal of Alloys and Compounds**, 381, 266–271.

[27] Hua, Z., Wang, X. M., Xiao, P. and Shi, J. (2006). Solvent effect on microstructure of yttria-stabilized zirconia (YSZ) particles in solvothermal synthesis. **Journal of the European Ceramic Society**, 26, 2257–2264.

[28] Hu, M. Z.-C., Payzant, E. A., and Byers, C. H. (2000). Sol–Gel and Ultrafine Particle Formation via Dielectric Tuning of Inorganic Salt–Alcohol–Water Solutions. **Journal of Colloid and Interface Science**, 222, 20–36.

[29] **Plasma display panel.** (2002). Retrieved June 11, 2011, from http://www.britannica.com/EBchecked/media/67339/Cross-section-of-a-flat-panel-plasma-display-for-wide

[30] Materials for ceramic structures. **ZIRCONIA**. (2010). Retrieved June 16, 2011, from http://www.odontosalud.com/web/tecnologia_detalle_en.php?id=23

[31] Ray, J. C., Pati, R. K. and Pramanik, P. (2000). Chemical synthesis and structural characterization of nanocrystalline powders of pure zirconia and yttria stabilized zirconia (YSZ). **Journal of the European Ceramic Society**, 20, 1289-1295.

[32] **Zirconium Oxide**. (2002). Retrieved June 16, 2011, from http://www.bredent.co.uk/dentists/zirconium_implants/whitesky_material.php

[33] Liu, S., Zhang, X., Li, J., Zhao, N., Wei, W. and Sun, Y. (2008). Preparation and application of stabilized mesoporous MgO–ZrO_2 solid base. **Catalysis Communications**, 9, 1527–1532.

[34] Liu, S., Ma, J., Guan, L., Li, J., Wei, W and Sun, Y. (2009). Mesoporous CaO–ZrO_2 nano-oxides: A novel solid base with high activity and stability. **Microporous and Mesoporous Materials**, 117, 466–471.

[35] Gutierrez-Mora, F., Domı´nguez-Rodrı´guez, A. and Routbort, J. L. (1999). Joining of Yttria-Tetragonal Stabilized Zirconia Polycrystals using nanocrystals. **Scripta Materialia**, 41, 455–460.

[36] Singh, K.A., Pathak, L.C. and Roy, S.K. (2007). Effect of citric acid on the synthesis of nano-crystalline yttria stabilized zirconia powders by nitrate–citrate process. **Ceramics International**, 33, 1463–1468.

[37] Butz, B., Kruse, P., Störmer, H., Gerthsen, D., Müller, A., Weber, A., Ivers-Tiffée, E. (2006). Correlation between microstructure and degradation in conductivity for cubic Y_2O_3-doped ZrO_2. **Solid State Ionics**, 177, 3275–3284.

[38] Farhikhteh, S., Maghsoudipour, A. and Raissi, B. (2010). Synthesis of nanocrystalline YSZ (ZrO_2-$8Y_2O_3$) powder by polymerized complex method. **Journal of Alloys and Compounds**, 491, 402–405.

[39] Deville, S., Gue´nin, G. and Chevalier, J. (2004). Martensitic transformation in zirconia Part II. Martensite growth. **Acta Materials**, 52, 5709–5721.

[40] Ray, J.C., Saha, C.R. and Pramanik, P. (2002). Stabilized nanoparticles of metastable ZrO_2 with Cr^{3+}/Cr^{4+} cations: preparation from a polymer precursor and the study of the thermal and structural properties. **Journal of the European Ceramic Society**, 22, 851–862.

[41] **Fuel Cells**. (2010). Retrieved June 16, 2011, from http://www.doitpoms.ac.uk/tlplib/fuel-cells/printall.php

[42] Bokhimi, X., Morales, A., Garcõ«a-Ruiz, A., Xiao, T. D., Chen, H., and Strutt, P. R. (1999). Transformation of Yttrium-Doped Hydrated Zirconium into Tetragonal and Cubic Nanocrystalline Zirconia. **Journal of Solid State Chemistry**, 142, 409-418.

[43] Yang, H., Ouyang, J., Zhang, X., Wang, N. and Du, C. (2008). Synthesis and optical properties of yttria-doped ZrO_2 nanopowders. **Journal of Alloys and Compounds**, 458, 474–478.

[44] Wang, S. F., Gu, F., Lu, M. K., Yang, Z. S., Zhou, G. J., Zhang, H. P., Zhou, Y.Y. and Wang, S. M. (2006). Structure evolution and photoluminescence properties of ZrO_2:Eu^{3+} nanocrystals. **Optical Materials**, 28, 1222–1226.

[45] Lange, S., Sildos, I., Hartmanova, M., Aarik, J. and Kiisk, V. (2008). Luminescence properties of Sm^{3+}-doped polycrystalline ZrO_2. **Journal of Non-Crystalline Solids**, 354, 4380–4382.

[46] Diaz-Torres, L.A., De la Rosa, E., Salas, P., Romero, V.H. and Angeles-Cha´ vez, C. (2008). Efficient photoluminescence of Dy^{3+} at low concentrations in nanocrystalline ZrO_2. **Journal of Solid State Chemistry**, 181, 75–80.

[47] Ramos-Brito, F., Alejo-Armenta, C., Garcı´a-Hipo´lito, M., Camarillo, E., Herna´ndez A, J., Murrieta S, H. and Falcony, C. (2008). Photoluminescent emission of Pr^{3+} ions in different zirconia crystalline forms. **Optical Materials**, 30, 1840–1847.

[48] Moon, B. K., Jeong, J. H., Yib, S.-S., Choic, S. E., Kimd, P. S., Choid, H. and Kim, J. H. (2007). Luminous properties of Tb^{3+} in the ZrO_2 and TiO_2 nanoparticles. **Journal of Luminescence**, 122–123, 873–875.

[49] Liu, H.-Q., Wang, L.-L., Chen, S.-G. and Zou, B.-S. (2008). Optical properties of nanocrystal and bulk ZrO_2: Eu^{3+}. **Journal of Alloys and Compounds**, 448, 336–339.

[50] Lo´pez-Luke, T., De la Rosa, E., So´ lis, D., P. Salas, Angeles-Chavez, C., Montoya, A., Dı´az-Torres, L.A. and Bribiesca, S. (2006). Effect of the CTAB concentration on the upconversion emission of ZrO_2:Er^{3+} nanocrystals. **Optical Materials**, 29, 31–37.

[51] Patra, A. (2004). Effect of crystal structure and concentration on luminescence in Er^{3+}: ZrO_2 nanocrystals. **Chemical Physics Letters**, 387, 35–39.

[52] Wang, S. F., Gu, F., Lu, M. K., Zhou, G. J., Ai, Z. P., Xu, D. and Yuan, D. R. (2003). Preparation and luminescent characteristics of Mn^{2+}, Er^{3+} co-doped ZrO_2 nanocrystals. **Journal of Crystal Growth**, 257, 84–88.

[53] Wang, S. F., Gu, F., Lu, M. K., Liu, S. W., Xu, D., Yuan, D. R., etc. (2003). Effect of Pb^{2+} on the photoluminescence characteristics of ZrO_2: Mn^{2+} nanocrystals. **Inorganic Chemistry Communications**, 6, 1275–1277.

[54] Zhang, H., Fu, X., Niu, S., Sun, G. and Xin, Q. (2005). Synthesis and characterization of ZrO_2: Eu nanopowder by EDTA complexing sol–gel method, **Materials Chemistry Physics**, 91, 361–364.

[55] Quan, Z.W., Wang, L.S. and Lin, J. (2005). Synthesis and characterization of spherical ZrO_2: Eu^{3+} phosphors by spray pyrolysis process. **Materials Research Bulletin**, 40, 810–820.

[56] Huangqing, L., Lingling, W., Shuguang, C., Bingsuo, Z. and Zhiwei, P. (2007). Effect of annealing temperature on luminescence of Eu^{3+} ions doped nanocrystal zirconia. **Applied Surface Science**, 253, 3872–3876.

[57] Smits, K., Grigorjeva, L., Millers, D., Sarakovskis, A., Opalinska, A., Fidelus, J.D. and Lojkowski, W., (2010). Europium doped zirconia luminescence, **Optical Materials**, 32, 827–831.

[58] Fu, X., Niu, S., Zhang, H. and Xin, Q. (2006). Photoluminescence of Dy^{3+} ions in yttrium-stabilized zirconium oxide with different phases. **Materials Science and Enggineering**, B 129, 14–17.

[59] Fidelus, J.D., Yatsunenko, S., Godlewski, M., Paszkowicz, W., Werner-Malentob, E. and Lojkowskia, W. (2009). Relation between structural properties of Pr^{3+}-doped yttria stabilized zirconia nanopowders and their luminescence efficiency. **Scripta Materialia**, 61, 415–418.

[60] Park, S. K., Kuo, C.-C., Anthony, J. E. and Jackson, T. N. (2005). High Mobility Solution-Processed OTFTs. **IEEE Electron Device Letter.**

[61] Stratasys, J. H. **Spin casting**. (2009). Retrieved June 16, 2011, from http://www.fortus.com/uploadedFiles/North_America/Downloads/Application_Guides_(All)/AG-SpinCasting-0109.pdf

[62] **Bragg's Law and Diffraction**. (2010). Retrieved July 11, 2011. http://www.eserc.stonybrook.edu/ProjectJava/Bragg/

[63] Skoog, D. A. and Leary, J. J. (1992). **Principles of Instrumental Analysis**: **Infared Absorption Spectroscopy** (4^{th} ed). United State of America: Saunders College Publishing Japan.

[64] Cao, G. (2004). **Nanostructures and Nanomaterials**: **Scanning electron microscopy**. Singapore: Imperrial College Press.

[65] **Sample Collection and Preparation**. (2011). Retrieved July 11, 2011, from http://serc.carleton.edu/research_education/geochemsheets/techniques/SEM.html

[66] **Energy Level Diagram**. (2011). Retrieved July 11, 2011, from http://www.cem.msu.edu/~cem333/Week05.pdf

[67] **Excitation.** (2011). Retrieved July 11, 2011, from http://www.britannica.com/EBchecked/topic/197770/excitation

[68] **Emission spectroscopy**. (2011). Retrieved July 11, 2011, from http://en.wikipedia.org/wiki/Emission_spectroscopy#Emission_spectroscopy

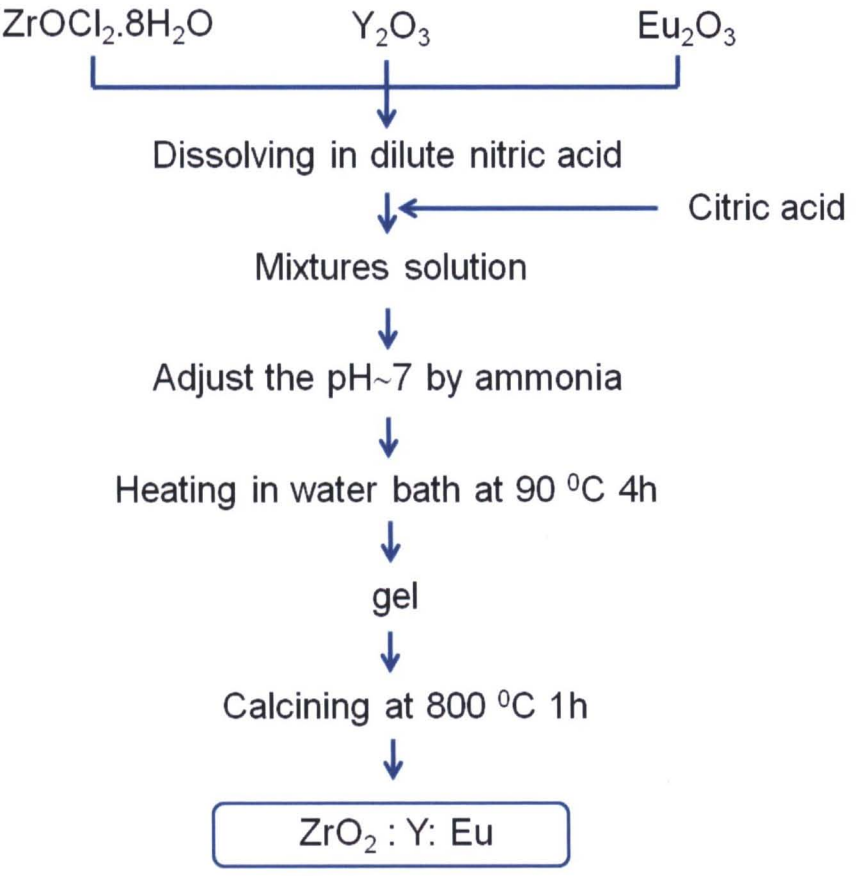
[69] **Absorption**. (2009). Retrieved July 11, 2011, from http://assay.nih.gov/assay/index.php/Section17:Spectrophotometry

[70] Yu, M., Lin, J., Fu, J., Zhang, H. J. and Han, Y. C. (2003). Sol–gel synthesis and photoluminescent properties of $LaPO_4$: A (A = Eu^{3+}, Ce^{3+}, Tb^{3+}) nanocrystalline thin films. **Journal Materials Chemistry**, 13, 1413–1419.

APPENDIX

APPENDIX A

Preparation of ZrO_2: Y: Eu powder samples



APPENDIX B

Monoclinic phase

Name and formula

Reference code:	01-083-0941
ICSD name:	Zirconium Oxide
Empirical formula:	O_2Zr
Chemical formula:	ZrO_2

Crystallographic parameters

Crystal system:	Monoclinic
Space group:	P21/c
Space group number:	14
a (Å):	5.1505
b (Å):	5.2077
c (Å):	5.3164
Alpha (°):	90.0000
Beta (°):	99.2230
Gamma (°):	90.0000
Calculated density (g/cm^3):	5.81
Volume of cell (10^6 pm^3):	140.75
Z:	4.00
RIR:	4.76

Subfiles and Quality

Subfiles:	Inorganic
	Alloy, metal or intermetalic
	Corrosion
	Modelled additional pattern
Quality:	Calculated (C)

Comments

ICSD collection code:	080047
Test from ICSD:	At least one TF implausible.

References

Primary reference: Calculated from ICSD using POWD-12++, (1997)

Structure: Bondars, B., Heidemane, G., Grabis, J., Laschke, K., Boysen, H., Schneider, J., Frey, F., J. Mater. Sci., 30, 1621, (1995)

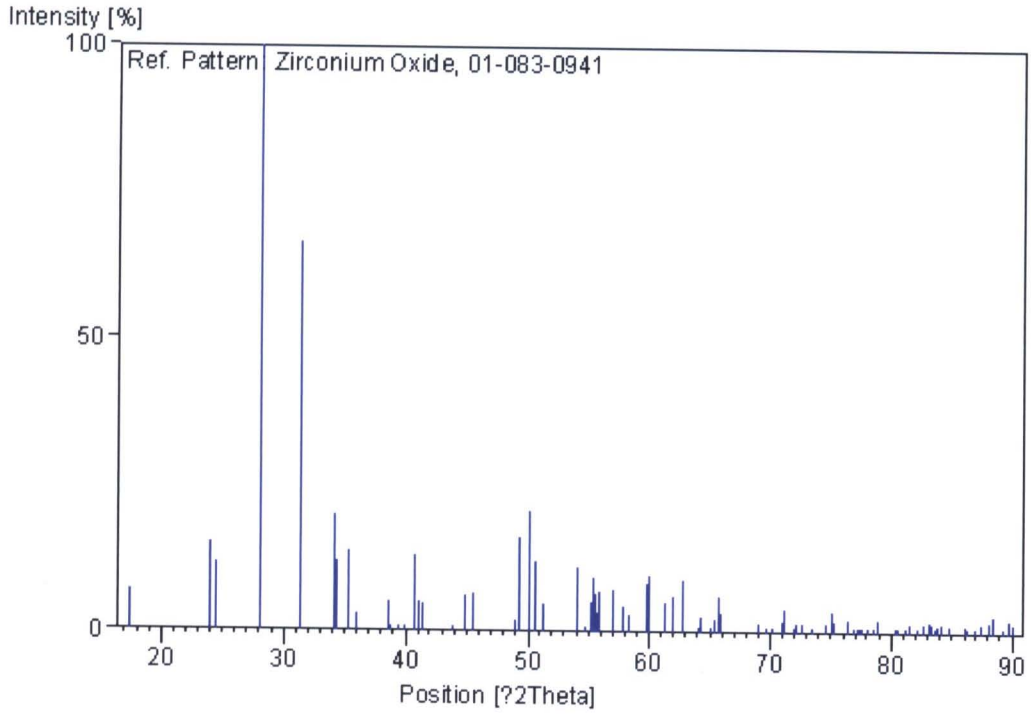
Peak list

No.	h	k	l	d [A]	2Theta[deg]	I [%]
1	1	0	0	5.08391	17.430	7.0
2	0	1	1	3.69645	24.056	15.2
3	1	1	0	3.63785	24.449	11.8
4	-1	1	1	3.16447	28.177	100.0
5	1	1	1	2.84104	31.463	66.7
6	0	0	2	2.62384	34.144	20.0
7	0	2	0	2.60385	34.415	12.1
8	2	0	0	2.54196	35.280	13.9
9	-1	0	2	2.50068	35.882	2.9
10	0	2	1	2.33250	38.567	5.2
11	1	2	0	2.31756	38.826	0.4
12	2	1	0	2.28435	39.414	0.8
13	-1	1	2	2.25425	39.962	0.5
14	-2	1	1	2.21449	40.711	13.1
15	1	0	2	2.19278	41.132	5.2
16	-1	2	1	2.17969	41.391	4.6
17	1	2	1	2.06499	43.805	0.1
18	1	1	2	2.02093	44.811	6.3
19	-2	0	2	1.99223	45.493	6.5
20	-2	1	2	1.86072	48.910	1.9
21	0	2	2	1.84823	49.263	16.2
22	2	2	0	1.81892	50.111	20.8

23	-1	2	2	1.80362	50.565	12.0
24	-2	2	1	1.78305	51.191	4.7
25	2	0	2	1.69497	54.061	10.9
26	1	2	2	1.67726	54.679	0.5
27	2	2	1	1.66069	55.271	5.1
28	0	1	3	1.65818	55.362	9.2
29	-1	1	3	1.65219	55.580	6.6
30	0	3	1	1.64807	55.731	3.5
31	1	3	0	1.64278	55.926	6.8
32	3	1	0	1.61091	57.133	7.2
33	-1	3	1	1.59143	57.898	4.4
34	-2	2	2	1.58224	58.266	3.0
35	1	3	1	1.54510	59.807	8.3
36	-3	0	2	1.54051	60.004	9.5
37	1	1	3	1.51025	61.334	5.2
38	-2	1	3	1.49677	61.947	6.0
39	3	1	1	1.47853	62.797	8.8
40	0	2	3	1.45200	64.080	1.1
41	-1	2	3	1.44797	64.279	2.6
42	2	3	0	1.43353	65.006	0.8
43	-1	3	2	1.42600	65.392	2.2
44	2	2	2	1.42052	65.676	6.1
45	-2	3	1	1.41577	65.924	3.4
46	1	3	2	1.36104	68.939	1.8
47	1	2	3	1.34957	69.608	0.6
48	-2	2	3	1.33992	70.183	0.5
49	3	2	1	1.32585	71.040	1.9
50	-1	0	4	1.32263	71.239	4.2
51	0	0	4	1.31192	71.911	0.9
52	-2	3	2	1.30877	72.111	1.5
53	0	4	0	1.30192	72.550	1.5
54	-3	1	3	1.28696	73.531	0.4

55	4	0	0	1.27098	74.611	1.6
56	0	4	1	1.26362	75.121	3.7
57	1	4	0	1.26123	75.288	2.1
58	-4	1	1	1.24595	76.376	2.2
59	-1	4	1	1.23754	76.990	0.3
60	4	1	0	1.23474	77.197	0.8
61	0	3	3	1.23215	77.389	0.8
62	-1	3	3	1.22968	77.573	0.7
63	1	0	4	1.22374	78.021	0.9
64	-2	1	4	1.21579	78.629	0.5
65	3	3	0	1.21262	78.875	2.2
66	2	2	3	1.19423	80.334	0.4
67	1	1	4	1.19094	80.602	0.3
68	-3	2	3	1.18313	81.245	0.5
69	-1	2	4	1.17922	81.571	1.6
70	0	2	4	1.17161	82.215	0.5
71	1	3	3	1.16768	82.552	1.6
72	0	4	2	1.16625	82.675	0.6
73	4	1	1	1.16142	83.095	2.1
74	2	4	0	1.15878	83.326	1.6
75	-1	4	2	1.15479	83.679	0.4
76	3	3	1	1.15283	83.854	1.4
77	-2	4	1	1.14934	84.167	1.7
78	4	2	0	1.14218	84.817	1.2
79	-3	0	4	1.12863	86.080	1.2
80	-2	2	4	1.12713	86.223	0.5
81	1	4	2	1.11947	86.959	0.3
82	2	4	1	1.11451	87.443	1.7
83	1	2	4	1.10752	88.137	2.1
84	3	1	3	1.10428	88.463	3.0
85	2	0	4	1.09639	89.268	0.9
86	-4	1	3	1.09203	89.721	2.4

Stick Pattern



APPENDIX C

Tetragonal phase

Name and formula

Reference code:	01-081-1544
ICSD name:	Zirconium Oxide
Empirical formula:	$O_{1.95}Zr$
Chemical formula:	$ZrO_{1.95}$

Crystallographic parameters

Crystal system:	Tetragonal
Space group:	P42/nmc
Space group number:	137
a (Å):	3.6067
b (Å):	3.6067
c (Å):	5.1758
Alpha (°):	90.0000
Beta (°):	90.0000
Gamma (°):	90.0000
Calculated density (g/cm^3):	6.04
Volume of cell (10^6 pm^3):	67.33
Z:	2.00
RIR:	10.26

Subfiles and Quality

Subfiles:	Inorganic
	Alloy, metal or intermetalic
	Corrosion
	Modelled additional pattern
Quality:	Calculated (C)

Comments

ICSD collection code:	072949

References

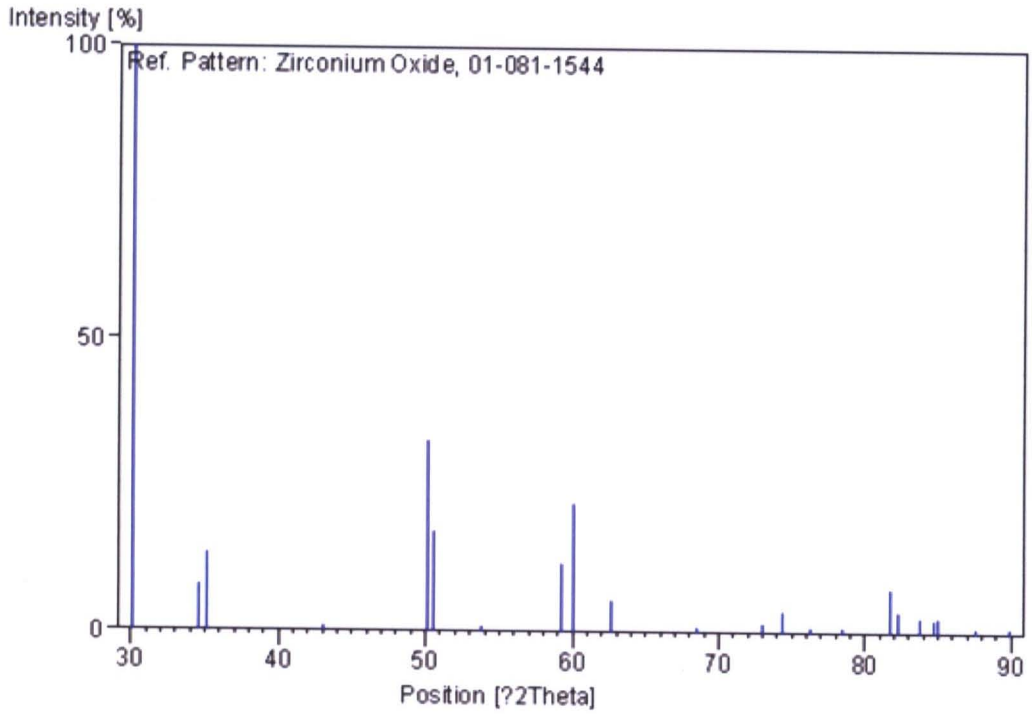
Primary reference: Calculated from ICSD using POWD-12++, (1997)

Structure: Martin, U., Boysen, H., Frey, F., Acta Crystallogr., Sec. B: Structural Science, 49, 403, (1993)

Peak list

No.	h	k	l	d [A]	2Theta[deg]	I [%]
1	1	0	1	2.95911	30.177	100.0
2	0	0	2	2.58790	34.634	8.0
3	1	1	0	2.55032	35.160	13.5
4	1	0	2	2.10263	42.981	0.9
5	1	1	2	1.81649	50.182	32.6
6	2	0	0	1.80335	50.574	17.3
7	2	0	1	1.70294	53.787	0.1
8	1	0	3	1.55637	59.331	11.5
9	2	1	1	1.53992	60.029	22.0
10	2	0	2	1.47956	62.749	5.5
11	2	1	2	1.36885	68.490	0.2
12	0	0	4	1.29395	73.069	1.7
13	2	2	0	1.27516	74.325	3.9
14	2	0	3	1.24664	76.326	0.1
15	1	0	4	1.21794	78.464	0.2
16	2	1	3	1.17824	81.653	7.6
17	3	0	1	1.17106	82.262	3.8
18	1	1	4	1.15392	83.757	2.7
19	2	2	2	1.14384	84.665	2.2
20	3	1	0	1.14054	84.968	2.8
21	3	1	1	1.11382	87.511	0.1
22	3	0	2	1.09032	89.900	0.1

Stick Pattern



APPENDIX D

Cubic phase

Name and formula

Reference code:	01-081-1550
ICSD name:	Zirconium Oxide
Empirical formula:	$O_{2.12}Zr$
Chemical formula:	$ZrO_{2.12}$

Crystallographic parameters

Crystal system:	Cubic
Space group:	Fm-3m
Space group number:	225
a (Å):	5.1291
b (Å):	5.1291
c (Å):	5.1291
Alpha (°):	90.0000
Beta (°):	90.0000
Gamma (°):	90.0000
Calculated density (g/cm^3):	6.16
Volume of cell (10^6 pm^3):	134.93
Z:	4.00
RIR:	9.52

Subfiles and Quality

Subfiles:	Inorganic
	Alloy, metal or intermetalic
	Corrosion
	Modelled additional pattern
Quality:	Calculated (C)

Comments

ICSD collection code:	072955
Test from ICSD:	At least one SOF implausible.

References

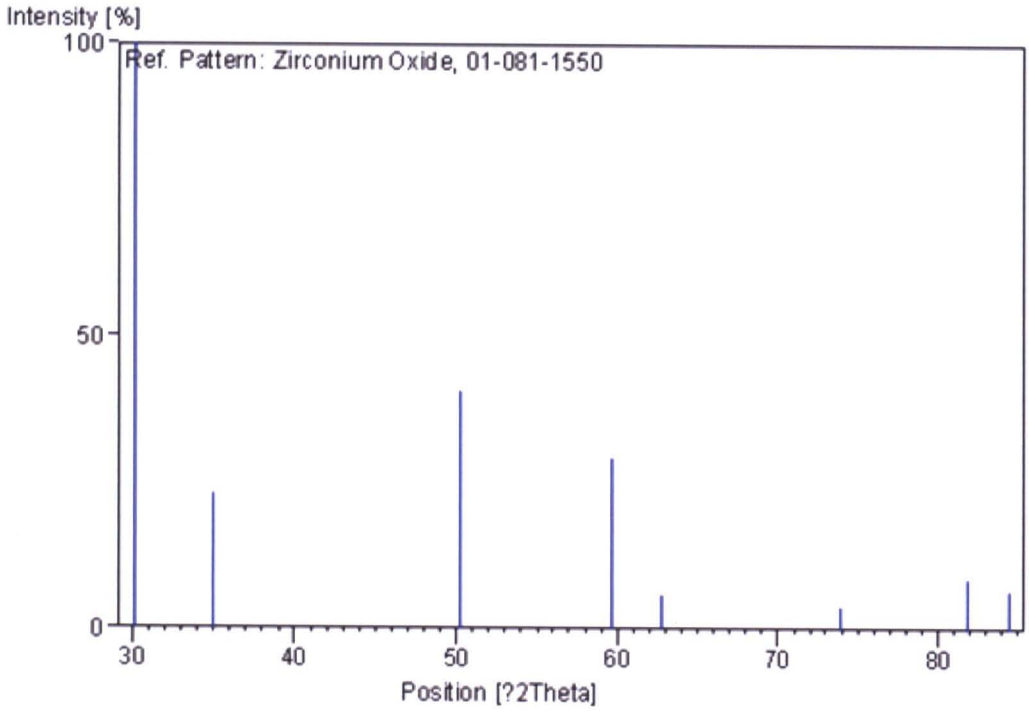
Primary reference: Calculated from ICSD using POWD-12++, (1997)

Structure: Martin, U., Boysen, H., Frey, F., Acta Crystallogr., Sec. B: Structural Science, 49, 403, (1993)

Peak list

No.	h	k	l	d [A]	2Theta[deg]	I [%]
1	1	1	1	2.96129	30.155	100.0
2	2	0	0	2.56455	34.959	23.2
3	2	2	0	1.81341	50.273	40.5
4	3	1	1	1.54648	59.749	29.1
5	2	2	2	1.48064	62.698	5.8
6	4	0	0	1.28228	73.844	3.8
7	3	3	1	1.17670	81.783	8.5
8	4	2	0	1.14690	84.387	6.4

Stick Pattern



BIOGRAPHY

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