



3 4456 0353265 7

ORNL/TM-11949

oml1

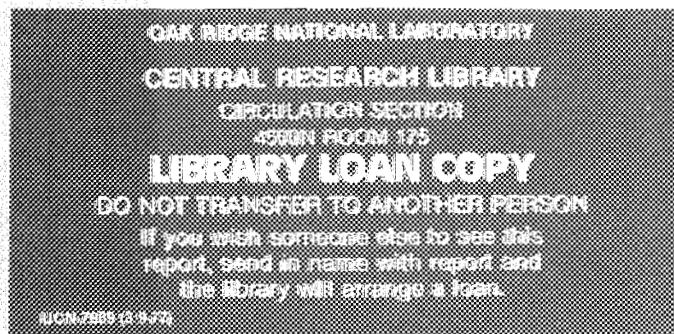
OAK RIDGE
NATIONAL
LABORATORY

MARTIN MARIETTA

A Comprehensive Review of the
XRD Data of the Primary and
Secondary Phases Present in the
BSCCO Superconductor System

(Part II: Ca-Sr-Pb Oxides)

B. J. Reardon
C. R. Hubbard



MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (615) 573-8401, FTS 826-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Metals and Ceramics Division

**A COMPREHENSIVE REVIEW OF THE XRD DATA OF THE
PRIMARY AND SECONDARY PHASES PRESENT IN
THE BSCCO SUPERCONDUCTOR SYSTEM**

(Part II: Ca-Sr-Pb Oxides)

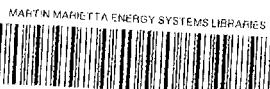
B. J. Reardon and C. R. Hubbard

Date Published: February 1992

NOTICE: This document contains information of a preliminary nature. It is subject to revision or correction and therefore does not represent a final report.

Prepared for the
U.S. Department of Energy
Assistant Secretary for Conservation and Renewable Energy
Office of Transportation Technologies
AK 06 00 00 0

Prepared by the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6285
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400



3 4456 0353265 ?

CONTENTS

	<u>Page</u>
LIST OF FIGURES.....	v
LIST OF TABLES.....	vii
ABSTRACT	1
1. INTRODUCTION	1
2. REVIEW PROCEDURE	2
3. RESULTS AND DISCUSSION.....	4
3.1 (Ca,Sr) ₂ PbO ₄	4
3.2 CaPbO ₃ and SrPbO ₃	6
4. CONCLUSIONS.....	8
5. ACKNOWLEDGMENTS.....	8
6. REFERENCES.....	8
APPENDIX A. (Ca,Sr) ₂ PbO ₄	11

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1 Simulated XRD plots of $\text{Ca}_{2-x}\text{Sr}_x\text{PbO}_4$ for $x = 0.0, 0.5, 1.0, 1.5,$ and $2.0 \dots \dots \dots$	2

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1 Nomenclature used in this report		3
2 MICRO-POWD calculation parameters		3
3 Crystallographic parameters of $\text{Ca}_x\text{Sr}_{2-x}\text{PbO}_4$		5
4 $(\text{Ca},\text{Sr})_2\text{PbO}_4$ unit cell parameters, D_x , and I/I_c		5
5 Three major lines of simulated Ca_2PbO_4 , CaSrPbO_4 , Sr_2PbO_4 , and PDF cards 24-207 (Ca_2PbO_4) and 22-1434 (Sr_2PbO_4)		6
6 FOMs of three possible space groups for SrPbO_3		7
A.1 Simulated X-ray powder pattern for Sr_2PbO_4		13
A.2 Simulated X-ray powder pattern for $\text{Ca}_{0.1}\text{Sr}_{1.9}\text{PbO}_4$		15
A.3 Simulated X-ray powder pattern for $\text{Ca}_{0.2}\text{Sr}_{1.8}\text{PbO}_4$		17
A.4 Simulated X-ray powder pattern for $\text{Ca}_{0.3}\text{Sr}_{1.7}\text{PbO}_4$		19
A.5 Simulated X-ray powder pattern for $\text{Ca}_{0.4}\text{Sr}_{1.6}\text{PbO}_4$		21
A.6 Simulated X-ray powder pattern for $\text{Ca}_{0.5}\text{Sr}_{1.5}\text{PbO}_4$		23
A.7 Simulated X-ray powder pattern for $\text{Ca}_{0.6}\text{Sr}_{1.4}\text{PbO}_4$		25
A.8 Simulated X-ray powder pattern for $\text{Ca}_{0.7}\text{Sr}_{1.3}\text{PbO}_4$		27
A.9 Simulated X-ray powder pattern for $\text{Ca}_{0.8}\text{Sr}_{1.2}\text{PbO}_4$		29
A.10 Simulated X-ray powder pattern for $\text{Ca}_{0.9}\text{Sr}_{1.1}\text{PbO}_4$		31
A.11 Simulated X-ray powder pattern for CaSrPbO_4		33
A.12 Simulated X-ray powder pattern for $\text{Ca}_{1.1}\text{Sr}_{0.9}\text{PbO}_4$		35
A.13 Simulated X-ray powder pattern for $\text{Ca}_{1.2}\text{Sr}_{0.8}\text{PbO}_4$		37
A.14 Simulated X-ray powder pattern for $\text{Ca}_{1.3}\text{Sr}_{0.7}\text{PbO}_4$		39
A.15 Simulated X-ray powder pattern for $\text{Ca}_{1.4}\text{Sr}_{0.6}\text{PbO}_4$		41
A.16 Simulated X-ray powder pattern for $\text{Ca}_{1.5}\text{Sr}_{0.5}\text{PbO}_4$		43

A.17	Simulated X-ray powder pattern for $\text{Ca}_{1.6}\text{Sr}_{0.4}\text{PbO}_4$	45
A.18	Simulated X-ray powder pattern for $\text{Ca}_{1.7}\text{Sr}_{0.3}\text{PbO}_4$	47
A.19	Simulated X-ray powder pattern for $\text{Ca}_{1.8}\text{Sr}_{0.2}\text{PbO}_4$	49
A.20	Simulated X-ray powder pattern for $\text{Ca}_{1.9}\text{Sr}_{0.1}\text{PbO}_4$	51
A.21	Simulated X-ray powder pattern for $\text{Ca}_2\text{SrPbO}_4$	53

**A COMPREHENSIVE REVIEW OF THE XRD DATA OF THE PRIMARY AND
SECONDARY PHASES PRESENT IN THE
BSCCO SUPERCONDUCTOR SYSTEM
(Part II: Ca-Sr-Pb Oxides)***

B. J. Reardon[†] and C. R. Hubbard

ABSTRACT

X-ray powder patterns for the phases in the CaO-SrO-PbO ternary system, along with the corresponding crystal structures, were obtained from the literature and from the Powder Diffraction File (PDF). Available X-ray diffraction (XRD) patterns were compared with each other and, when possible, with a calculated pattern for each phase, yielding a recommended reference pattern. The simulated powder patterns presented here deal with the phases found within the $(\text{Ca},\text{Sr})_2\text{PbO}_4$ solid solution series and are recommended for the PDF.

1. INTRODUCTION

The discovery of superconductivity in the Bi-Sr-Ca-Cu-O (BSCCO) system by Maeda et al.¹ has spurred intense research in the X-ray characterization of these materials. As a consequence, significant research has been conducted in the study of the phase diagrams of these four- and five-component systems.²⁻⁸ Unfortunately, accurate X-ray powder patterns and crystallographic data for many of the minor phases present in these systems are lacking. This is especially true in the case of the solid solution series whose patterns are significantly different from the corresponding end members (see Fig. 1). The lack of corresponding reference patterns in the Powder Diffraction File (PDF) severely limits identification of these phases by X-ray diffraction (XRD). Reference XRD data for the BSCCO superconductor

*Research sponsored by the U.S. Department of Energy, Assistant Secretary for Conservation and Renewable Energy, Office of Utility Technologies, Office of Energy Management/Advanced Utility Concepts - Superconducting Technology Program for Electric Systems, and by Office of Transportation Technologies as part of the High Temperature Materials Laboratory User Program, under contract DE-AC05-84OR21400 managed by Martin Marietta Energy Systems, Inc.

[†]Alfred University, Binns-Merril Hall, Alfred, NY 14802.

ORNL DWG-92-5026

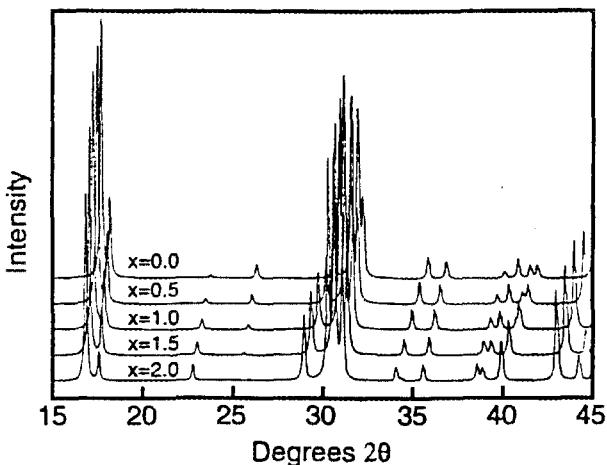


Fig. 1. Simulated XRD plots of $\text{Ca}_{2-x}\text{Sr}_x\text{PbO}_4$ for $x = 0.0, 0.5, 1.0, 1.5$ and 2.0 .

phases 2201, 2212, and 2223 were published by Matheis and Snyder.⁹ Furthermore, a critical review of the XRD data in the CaO-SrO-CuO system has recently been conducted and was presented as Part I of a comprehensive review.¹⁰

Pb has been shown to increase the stability and T_c of BSCCO superconductors.¹¹ Unfortunately, additions of Pb have also been known to easily lead to the formation of phases with CaO and SrO.¹²⁻²² This article (Part II of a continuing series extensively reviewing the XRD data of the BSCCO system) focuses on the phases found in the CaO-SrO-PbO ternary system.

The complete listing of the simulated XRD patterns for the phases and solid solutions discussed in this report is reported in Appendix A. Table 1 defines the nomenclature used here.

2. REVIEW PROCEDURE

An extensive review of the CaO-SrO-PbO ternary system phases and corresponding XRD data was conducted. Data utilized in this review included that obtained from literature surveys, PDF, and private communications. The identified phases are those found in the $(\text{Ca},\text{Sr})_2\text{PbO}_4$ solid solution series and the phases CaPbO_3 and SrPbO_3 .

Once an adequate understanding of the possible phases, solid solution series, crystal structures, and high-temperature polymorphs was acquired, powder patterns were simulated for all the phases (including solid solutions) using the personal computer (PC) version of MICRO-POWD.²³ The parameters used in these calculations are listed in Table 2. The

Table 1. Nomenclature used in this report

*	a rating given to powder patterns by the JCPDS symbolizing high quality and reliability
$\Delta\theta$	change in θ
2θ	two times the angle of diffraction
2201	$\text{Bi}_2\text{Sr}_2\text{CuO}_6$
2212	$\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$
2223	$\text{Bi}_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{10}$
a	an axis that defines a unit cell (in Å)
b	an axis that defines a unit cell (in Å)
B_{iso}	isotropic thermal parameter
c	an axis that defines a unit cell (in Å)
D	density (in g/cm ³)
d	d-spacing (in Å)
D_x	calculated density (in g/cm ³)
$h k l$	notation used to define crystallographic planes
I	intensity
I(DS)	relative intensity in Debye-Scherrer pattern
I(INT)	relative integrated peak intensity
I(PK)	relative peak intensity
I/I_c	intensity of the 100% peak/intensity of the 100% peak of corundum
I_{rel}	relative intensity
Nobs	number of observed peaks
Nposs	number of possible peaks
occ.	lattice site occupancy
Struct.	
S.G.	space group

Table 2. MICRO-POWD calculation parameters

-
1. Program: MICRO-POWD Version: 1
 2. Scattering factors as provided by MICRO-POWD for: O²⁻, Sr²⁺, Ca²⁺, Pb⁴⁺
 3. Anomalous scattering factors as provided by MICRO-POWD for: O, Sr, Ca, Pb
 4. B_{iso} (oxygen) = 2.5; B_{iso} (all others) = 1 unless structure reference provided thermal parameters
 5. No incident or diffracted beam monochromators used
 6. Theta compensating variable divergence slit not selected
 7. For relative peak intensities, a Cauchy profile was selected
 8. CuK α 1 radiation was selected ($\lambda = 1.5405981\text{\AA}$)
 9. The National Bureau of Standards (NBS) width table provided with MICRO-POWD supplied the full width at half maximum (FWHM) intensity
 10. Simulated patterns generated to 90° 2θ
-

simulated patterns and patterns acquired from the literature search and experiments were compared. Figures of merit (FOMs)²⁴ for all patterns were calculated using LSQ90, a version of the lattice parameter refinement program of Evans, Appleman, and Handwerker.²⁵ The comparisons of FOMs, simulated patterns, and experimental patterns resulted in a set of recommended reference powder patterns.

3. RESULTS AND DISCUSSION

The phases and solid solutions present in the CaO-SrO-PbO ternary system have been extensively studied by a number of authors.²⁶⁻³¹ The phase of primary concern when synthesizing BSCCO materials is $(\text{Ca},\text{Sr})_2\text{PbO}_4$. However, the $(\text{Ca},\text{Sr})\text{PbO}_3$ phase should also be studied in case it, too, is encountered when synthesizing BSCCO materials. CaO and SrO have already been evaluated in Part I (ref. 10) of this review.

3.1 $(\text{Ca},\text{Sr})_2\text{PbO}_4$

Ca_2PbO_4 and Sr_2PbO_4 have been shown to participate in a complete solid solution series across the entire pseudo-binary phase system.²⁶ Furthermore, numerous authors have observed a $(\text{Ca},\text{Sr})_2\text{PbO}_4$ solid solution when characterizing BSCCO materials.¹²⁻²² However, the PDF only has two cards that provide information for the $(\text{Ca},\text{Sr})_2\text{PbO}_4$ system: 24-207 (ref. 28) and 22-1434 (ref. 30) provide powder patterns for Ca_2PbO_4 and Sr_2PbO_4 , respectively. It should be noted that not only does significant peak shifting occur between these two phases, but the intensities change significantly enough to reassign the 100% intensity value from the (111) in Sr_2PbO_4 to the (110) in Ca_2PbO_4 . The lack of reference patterns within the solid solution series is of significant concern when trying to identify phases in a four- or five-component BSCCO system with Pb substitution. Thus, patterns were simulated for a series of solid solutions between Ca_2PbO_4 and Sr_2PbO_4 . Table 3 displays the crystallographic data for Ca_2PbO_4 and Sr_2PbO_4 used for the calculations of the simulated patterns across the solid solution series. A linear change in the cell parameters was assumed for this solid solution series, as indicated in Table 4. This assumption was based on experimental data given by Kitaguchi et al.²⁶ Table 5 displays the simulated XRD data for the main peaks of selected phases across the solid solution series and for the PDF cards 24-207 and 22-1434.

Appendix A lists the complete 2θ , d , $h \text{ } k \ell$, and I values for 21 patterns covering the $(\text{Ca},\text{Sr})_2\text{PbO}_4$ solid solution series. The 111 peak (2θ : 30.64 to 31.22, I_{rel} : 100 to 81)

Table 3. Crystallographic parameters of $\text{Ca}_x\text{Sr}_{2-x}\text{PbO}_4$ (ref. 28)

Struct.	S.G.	Atom.	Occ. 0<x<1	x	y	z
ortho	Pbam (55)	Pb	2.000	0.000000	0.000000	0.000000
		Sr	4x	0.077000	0.319000	0.500000
		Ca	4-4x	0.077000	0.319000	0.500000
		01	4.000	0.220000	0.050000	0.500000
		02	4.000	0.360000	0.310000	0.000000

Table 4. $(\text{Ca},\text{Sr})_2\text{PbO}_4$ unit cell parameters,^{26,28,30} D_x , and I/I_c

Phase Ca:Sr	a	b	c	D_x	I/I_c
2.0:0.0	5.83600	9.74500	3.38100	6.067	7.615
1.9:0.1	5.85230	9.76170	3.38720	6.110	7.368
1.8:0.2	5.86860	9.77840	3.39340	6.153	7.130
1.7:0.3	5.88490	9.79510	3.39960	6.195	6.899
1.6:0.4	5.90120	9.81180	3.40580	6.236	6.676
1.5:0.5	5.91750	9.82850	3.41200	6.277	6.460
1.4:0.6	5.93380	9.84520	3.41820	6.316	6.250
1.3:0.7	5.95010	9.86190	3.42440	6.162	6.356
1.2:0.8	5.96640	9.87860	3.43060	6.394	6.185
1.1:0.9	5.98270	9.89530	3.43680	6.432	6.189
1.0:1.0	5.99900	9.91200	3.44300	6.469	6.194
0.9:1.1	6.01530	9.92870	3.44920	6.506	6.198
0.8:1.2	6.03160	9.94540	3.45540	6.542	6.203
0.7:1.3	6.04790	9.96210	3.46160	6.578	6.209
0.6:1.4	6.06420	9.97880	3.46780	6.612	6.214
0.5:1.5	6.08050	9.99550	3.47400	6.647	6.220
0.4:1.6	6.09680	10.01220	3.48020	6.680	6.226
0.3:1.7	6.11310	10.02890	3.48640	6.713	6.233
0.2:1.8	6.12940	10.04560	3.49260	6.746	6.239
0.1:1.9	6.14570	10.06230	3.49880	6.778	6.246
0.0:2.0	6.16200	10.07900	3.50500	6.809	6.253

**Table. 5. Three major lines of simulated Ca_2PbO_4 ,
 CaSrPbO_4 , Sr_2PbO_4 , and PDF cards 24-207
(Ca_2PbO_4) and 22-1434 (Sr_2PbO_4)**

$h k l$	Ca_2PbO_4		CaSrPbO_4		Sr_2PbO_4	
	d	I	d	I	d	I
1 1 0	5.007	100	5.132	96	5.257	68
1 3 0	2.838	48	2.894	72	2.950	87
1 1 1	2.802	75	2.859	100	2.916	100
24-207						22-1434
$h k l$	d	I			d	I
1 1 0	4.98	100			5.26	35
1 3 0	2.832	55			2.95	90
1 1 1	2.793	85			2.917	100
FOM	21.81				56.42	
Nobs	30				30	
Npos	39				46	
$\Delta 2\theta$	0.035				0.012	

$\Delta 2\theta$ greater than 0.1° in some instances and greater than 0.15° in others as the x in $\text{Ca}_x\text{Sr}_{2-x}\text{PbO}_4$ changes from 0 to 2 in increments of 0.2. The available PDF cards for the end members of the solid solution series agree reasonably well with the simulated patterns. They each have an adequate FOM: $F(30) = 21.81$ (0.035,39) for 24-207 and $F(30) = 56.42$ (0.012,46) for 22-1434. The agreement of intensities for Ca_2PbO_4 (24-207) is quite acceptable. Sr_2PbO_4 (22-1434) shows a larger discrepancy in intensity, particularly for the (110) line. Consequently, it is recommended that every other one of the patterns present in Appendix A, that is, the simulated patterns for $x = 0.2, 0.4, \dots 2.0$ in formula $\text{Ca}_x\text{S}_{2-x}\text{PbO}_4$, be incorporated into the PDF.

3.2 CaPbO_3 and SrPbO_3

Evidence for a possible $(\text{Ca},\text{Sr})\text{PbO}_3$ solid solution is not available. In fact, data on both CaPbO_3 and SrPbO_3 seem to be limited. Kitaguchi et al.²⁶ report the existence of SrPbO_3 but not CaPbO_3 . Kuxmann et al.²⁷ report only Ca_2PbO_4 and not CaPbO_3 in the CaO-PbO phase diagram. Furthermore, Kitaguchi et al.²⁷ report that while the $(\text{Ca},\text{Sr})_2\text{PbO}_4$ phase formed a solid solution, no solid solution exists between CaPbO_3 and SrPbO_3 .

Shannon²⁹ reported that SrPbO_3 has orthorhombic symmetry with a probable space group of Pbnm with cell parameters of $a = 5.8595\text{\AA}$, $b = 5.9568\text{\AA}$, and $c = 8.3253\text{\AA}$. Keester et al.³⁰ reported a slightly different symmetry for SrPbO_3 (Pnma or Pna₂₁), but their results were not as accurate as Shannon's because the resolution of their powder diffractometer could not distinguish between Pnma: [(0k ℓ), $k + \ell = 2n$ and (hk0), $h = 2n$] and Pbnm: [(h0 ℓ) $h + \ell = 2n$ and (0k ℓ) $k = 2n$] (ref. 29). The PDF card 25-898 is based on Shannon's results. Table 6 shows the FOM values assuming different crystal structures (Pbnm, Pna₂₁, and Pnam). The Pbnm structure has the largest FOM [F(30) = 61.53 (0.014, 36)]. Therefore, no change to PDF card 25-898 is indicated. Since no structural data have been reported to date, simulation of the powder pattern must wait until these data are available.

Table 6. FOMs of three possible space groups for SrPbO_3

S.G.	Pbmn (53)	Pna ₂ ₁ (33)	Pnma (62)
FOM	61.53	41.80	33.69
Nobs	30	30	30
Npos	36	53	66
$\Delta 2\theta$	0.0135	0.0135	0.0135
No. of unindexed lines from 25-898	0	0	6

The existence of CaPbO_3 has been reported by Levey-Clement et al.³¹ This phase was prepared by dehydration of the hexahydroxyplumbate $\text{CaPb}(\text{OH})_6$, not by solid-state synthesis. This phase is reported to have a hexagonal structure with an unspecified space group. The cell parameters are $a = 5.688\text{\AA}$ and $c = 15.328\text{\AA}$. As with Sr_2PbO_3 , the structural data have not yet been reported. The results obtained by Levey-Clement et al.³¹ are represented in PDF card 26-310. If a primitive cell is assumed, reliable FOM can be obtained [F(30) = 25.90 (0.018, 66)].

4. CONCLUSIONS

The XRD patterns of phases found in the CaO-SrO-PbO ternary system have been reviewed and simulated to produce recommended powder patterns for these phases. The complete set of simulated patterns for $(\text{Ca},\text{Sr})_2\text{PbO}_4$ is presented in Appendix A. In order to complete the understanding of the secondary phases possible in the synthesis in the BSCCO system, further experimental analysis of the CaPbO_3 - SrPbO_3 pseudo-binary system is needed. Without this analysis, accurate crystallographic and powder diffraction data, limits of Ca and Sr solubility, and stable temperature regimes cannot be obtained.

5. ACKNOWLEDGMENTS

The assistance of the International Centre for Diffraction Data, O. B. Cavin, the support of the Oak Ridge Science and Engineering Research Semester, and Oak Ridge Associated Universities are gratefully acknowledged.

6. REFERENCES

1. H. Maeda et al., "A New High-Tc Oxide Superconductor without a Rare Earth Element," *Jpn. J. Appl. Phys.* **27**, L209 (1988).
2. R. Roth et al., "Phase Equilibria of the System SrO-CaO-CuO ," *J. Am. Ceram. Soc.* **72**(8), 1545 (1989).
3. R. Roth et al., "Phase Equilibria and Crystal Chemistry in the Quaternary System Ba-Sr-Y-CuO in Air," *J. Am. Ceram. Soc.* **72**(3), 395 (1989).
4. R. Roth et al., "Phase Equilibria and Crystal Chemistry in Portions of the System $\text{SrO-CaO-Bi}_2\text{O}_3-\text{CuO}$, Part II - The System $\text{SrO-Bi}_2\text{O}_3-\text{CuO}$," *J. Res. Natl. Inst. Stand. Technol.* **95**, 291 (1990).
5. P. Majewski et al., "Phase Equilibrium Diagrams of Bi_2O_3 - SrO-CaO-CuO ," to be published in *Adv. Mater.*
6. K. Schulze et al., "Phase Equilibrium in the System Bi_2O_3 - SrO-CaO-CuO-A Tool for Processing the High-Tc Superconducting Bismuth Compounds," to be published in *Zeitschrift fur Metallkunde*.
7. M. Vallino et al., "Subsolidus Phase Relations in the SrO-CaO-CuO-O and $\text{SrO-Y}_2\text{O}_3$ - CaO-O Systems," *Mater. Chem. Phys.* **22**, 523 (1989).

8. C. Lee et al., "Equilibrium Phase Relations in the Bi-Ca-Sr-Cu-O System at 850 & 900°C," *J. Mater. Res.* **5**(7), 1403 (1990).
9. D. Matheis and R. Snyder, "Crystal Structure and Powder Diffraction Patterns of the Bismuth and Thallium Ruddleson Popper Copper Oxide Superconductors," *Powder Diff.* **5**(1), 8 (1990).
10. B. Reardon and C. Hubbard, "A Comprehensive Review of the XRD Data of the Primary and Secondary Phases Present in the BSCCO Superconductor System (Part I: The Ca-Sr-Cu-O System)," ORNL/TM-11948, Martin Marietta Energy Systems, Inc., Oak Ridge Natl. Lab., 1992.
11. L. Pierre et al., "Role of Lead Substitutions in the Production of 110 K Superconducting Single-Phase Bi-Sr-Ca-Cu-O Ceramics," *J. Appl. Phys.* **68**(5), 2296 (1990).
12. Y. Huang et al., "Formation Mechanisms of 110 K High-Tc Superconducting Phase in the Ca- and Cu-Rich Bi-Sr-Ca-Cu-O," *Physica C* **169**, 76 (1990).
13. W. Carrillo and W. Göpel, "Influence of High-Temperature Annealing on the $(\text{Bi},\text{Pb})_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{10}$ Phase and Determination of its Crystal Structure by X-ray Powder Diffractometry," *Physica C* **161**, 373 (1989).
14. A. K. Sarkar et al., "Effect of Sintering Temperature on the Superconductive Properties of Bi(Pb)-Sr-Ca-Cu-O Ceramics," *Supercond. Sci. Technol.* **3**, 199 (1990).
15. H. Kitaguchi et al., "Preparation of the High-Tc Phase in the Bi-Pb-Sr-Ca-Cu-O System," *Mol. Cryst. Liq. Cryst.* **184**, 129 (1990).
16. M. Shiloh et al., "Formation of $(\text{Ca}_{1-x},\text{Sr}_x)_2\text{PbO}_4$ in the Bi(Pb)-Sr-Ca-Cu-O System: Correlation with the Formation of 2223 High-Tc Phase," *J. Appl. Phys.* **68**(5), 2304 (1990).
17. H. Yamanaka et al., "Preparation of Superconducting Bi-Pb-Ca-Cu-O Glass Ceramics with $T_c = 106$ K," *Jpn. J. Appl. Phys. Lett.* **28**, 2185 (1989).
18. T. Kanai, T. Kamo, and S. Matsuda, "Formation of the High-Tc Phase in Rapidly Quenched Bi-Pb-Ca-Cu-CO Ceramics," *Jpn. J. Appl. Phys.* **28**, 2188 (1989).
19. Y. Hayashi, H. Kogure, and Y. Gondo, "Growth of High-Tc Phase in the Bi-Pb-Sr-Ca-Cu-O Superconducting Oxide System," *Jpn. J. Appl. Phys.* **28**, 2182 (1989).
20. Y. Ibara et al., "Preparation and Crystallization Process of the High-Tc Superconducting Phase ($T_c(\text{end}) > 100$ K) in Bi-Pb-Sr-Ca-Cu-O Glass-Ceramics," *Jpn. J. Appl. Phys.* **28**, 37 (1989).

21. B. Reardon and R. Snyder, "Using Ga_2O_3 and In_2O_3 in the Glass-Ceramic Processing of Bi-System Superconductors," pp. 599-609 in *AIP Conference Proceedings 219, Superconductivity and Its Application*, Buffalo, 1990.
22. Y. Iwai et al., "Influence of the Oxygen Partial Pressure on the Solubility of PbO in the $(\text{Bi},\text{Pb})_2\text{Sr}_2\text{CaCu}_2\text{O}_{\delta+y}$ Superconducting Oxides," *Physica C 170*, 319 (1990).
23. D. Smith and K. Smith, "MICRO-POWD: A Program for Calculating X-ray Powder Diffraction Patterns on a P.C.," Materials Data, Inc., Livermore, Calif., 1987.
24. G. Smith and R. Snyder, " F_n : A Criterion for Rating Powder Diffraction Patterns and Evaluating the Reliability of Powder-Pattern Indexing," *J. Appl. Crystallogr. 12*, 60 (1979).
25. H. Evens, Jr., D. Appleman, and D. Handwerder, Report No. PB216188, U.S. Dept. of Commerce, National Technical Information Center, Springfield, Va., 1963.
26. H. Kitaguchi et al., "Equilibrium Phase Diagrams for the Systems PbO-SrO-CuO and PbO-CaO-SrO ," *J. Mat. Res. 5(7)*, 1397 (1990).
27. U. Kuxman and P. Fischer, *Erzmetall 27(11)*, 533 (1974) [reproduced in *Phase Diagrams for Ceramists*, Vol. 4].
28. V. M. Tromel, "Die Kristallstruktur der Verbindungen von Sr_2PbO_4 -Typ," *Zeit. Anorg. Allge. Chemie. 371*, 237 (1969).
29. R. Shannon, "Unit Cell and Space Group of SrPbO_3 ," *J. Solid State Chem. 3*, 184 (1971).
30. K. Keester and W. White, "Crystal Chemistry and Properties of Phases in the Systems SrO-PbO-O ," *J. Solid State Chem. 2*, 68 (1970).
31. C. Levey-Clement, I. Morgenstern-Badarau, and A. Michal, "Mise en Evidence De Deux Nouveaux Oxydes Doubles de Type Illmenite: Les Plombates de Cadmium CdPbO_3 et de Calcium CaPbO_3 ," *Mater. Res. Bull. 7*, 35 (1972).

APPENDIX A: $(\text{Ca},\text{Sr})_2\text{PbO}_4$

Table A.1. Simulated X-ray powder pattern for Sr₂PbO₄

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
16.85	16.86	5.257	1	1	0	63	68	24	54.59		1.6798	0	6	0	8	2	1
17.58	17.60	5.040	0	2	0	9	10	3	54.87	54.86	1.6718	3	2	1	5	7	12
22.78	22.78	3.901	1	2	0	6	6	4	55.20	55.20	1.6626	1	1	2	5	5	14
25.39	25.40	3.505	0	0	1	0	0	0	55.47	55.34	1.6553	0	2	2	1	3	3
28.96	28.96	3.081	2	0	0	27	26	25	56.76	56.76	1.6207	1	6	0	0	0	0
30.28	30.28	2.950	1	3	0	81	87	80	57.61	57.62	1.5986	1	2	2	1	1	2
30.31		2.946	2	1	0	8		8	57.87	57.88	1.5921	3	4	0	3	2	8
30.63	30.64	2.916	1	1	1	100	100	100	58.87	58.88	1.5674	3	3	1	8	7	25
31.05	31.06	2.877	0	2	1	45	46	46	60.00	60.00	1.5405	4	0	0	1	1	3
34.08	34.08	2.629	2	2	0	6	6	8	60.75	60.76	1.5233	2	0	2	7	7	21
34.37	34.36	2.607	1	2	1	1	1	1	60.77		1.5228	4	1	0	2		6
35.60	35.60	2.520	0	4	0	8	7	10	60.90	60.92	1.5200	2	5	1	1	5	4
38.57	38.58	2.332	1	4	0	7	7	10	61.13		1.5148	0	6	1	0		1
38.89	38.88	2.314	2	0	1	5	5	8	61.50	61.50	1.5066	1	3	2	19	17	63
39.91	39.94	2.257	1	3	1	1	17	1	61.52		1.5062	2	1	2	2		7
39.94		2.255	2	1	1	19		29	62.97	63.00	1.4749	2	6	0	6	7	22
42.97	42.98	2.103	2	2	1	45	40	80	63.05	63.04	1.4732	4	2	0	6	7	19
44.23	44.24	2.046	0	4	1	12	11	22	63.78	63.78	1.4582	2	2	2	2	2	8
45.01	45.00	2.013	3	1	0	6	6	12	64.20	64.20	1.4495	3	4	1	3	3	11
46.52	46.52	1.9505	2	4	0	6	6	13	64.74	64.74	1.4387	0	4	2	2	3	8
46.75	46.74	1.9417	1	4	1	3	4	6	64.74		1.4387	3	5	0	2		7
47.41	47.42	1.9159	1	5	0	1	2	3	66.21	66.22	1.4103	4	0	1	3	3	13
47.68	47.78	1.9057	2	3	1	1	5	1	66.65	66.66	1.4021	1	7	0	3	3	10
47.78		1.9021	3	2	0	5		10	66.71		1.4011	1	4	2	2		6
52.15	52.16	1.7525	0	0	2	13	19	33	66.75		1.4003	4	3	0	0		1
52.15		1.7524	3	3	0	8		19	66.94	66.92	1.3967	4	1	1	2	3	9
52.38	52.36	1.7454	3	1	1	13	15	32	69.03	69.10	1.3594	2	6	1	1	3	5
53.74	53.74	1.7044	2	4	1	13	11	34	69.11		1.3581	4	2	1	3	12	
54.34	54.56	1.6868	2	5	0	1	29	1	70.73	70.72	1.3309	3	5	1	4	3	17
54.54		1.6811	1	5	1	30		78	71.30	71.30	1.3217	3	1	2	3	3	13

Table A.1. (continued)

Table A.2. Simulated X-ray powder pattern for $\text{Ca}_{0.1}\text{Sr}_{1.9}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
16.89	16.90	5.245	1	1	0	65	71	25	54.69		1.6770	0	6	0	8		21
17.61	17.62	5.031	0	2	0	9	11	4	55.01	55.00	1.6679	3	2	1	4	6	12
22.82	22.84	3.893	1	2	0	6	6	3	55.31	55.32	1.6595	1	1	2	5	5	14
25.44	25.44	3.499	0	0	1	0	0	0	55.57	55.46	1.6524	0	2	2	1	3	3
29.04	29.04	3.073	2	0	0	27	26	24	56.86	56.86	1.6179	1	6	0	0	0	0
30.33	30.34	2.944	1	3	0	80	84	79	57.73	57.74	1.5957	1	2	2	1	1	2
30.39		2.939	2	1	0	8		8	58.02	58.02	1.5885	3	4	0	3	2	8
30.69	30.70	2.911	1	1	1	100	100	100	59.02	59.02	1.5639	3	3	1	8	7	25
31.11	31.12	2.872	0	2	1	45	46	46	60.18	60.18	1.5364	4	0	0	1	1	3
34.16	34.16	2.622	2	2	0	7	6	8	60.89	60.90	1.5203	2	0	2	7	6	21
34.44		2.602	1	2	1	1		1	60.95		1.5188	4	1	0	2		6
35.66	35.66	2.516	0	4	0	8	7	10	61.03	61.04	1.5171	2	5	1	1	5	3
38.64	38.64	2.328	1	4	0	7	6	10	61.24		1.5123	0	6	1	0		2
38.98	38.98	2.309	2	0	1	6	5	8	61.62	61.62	1.5039	1	3	2	19	17	62
39.99	40.04	2.253	1	3	1	1	17	1	61.65		1.5032	2	1	2	2		7
40.03		2.250	2	1	1	18		28	63.10	63.12	1.4721	2	6	0	6	6	22
43.07	43.08	2.098	2	2	1	45	40	80	63.23	63.24	1.4694	4	2	0	6	7	19
44.31	44.32	2.042	0	4	1	12	11	22	63.92	63.92	1.4553	2	2	2	2	2	8
45.13	45.14	2.007	3	1	0	7	6	12	64.36	64.36	1.4464	3	4	1	3	2	10
46.62	46.62	1.9465	2	4	0	7	6	13	64.87	64.88	1.4362	0	4	2	2	3	8
46.83	46.74	1.9382	1	4	1	3	4	6	64.90		1.4356	3	5	0	2		7
47.50	47.50	1.9125	1	5	0	2	2	3	66.40	66.40	1.4068	4	0	1	3	3	12
47.79	47.90	1.9018	2	3	1	1	4	1	66.78	66.80	1.3997	1	7	0	3	3	10
47.91		1.8973	3	2	0	5		10	66.84		1.3986	1	4	2	2		6
52.25	52.26	1.7494	0	0	2	13	17	32	66.93		1.3968	4	3	0	0	1	
52.29		1.7483	3	3	0	8		19	67.13	67.12	1.3932	4	1	1	2	2	8
52.51	52.50	1.7412	3	1	1	13	14	33	69.18	69.30	1.3569	2	6	1	1	3	6
53.85	53.86	1.7010	2	4	1	13	11	34	69.30		1.3548	4	2	1	3	1	2
54.46	54.66	1.6835	2	5	0	1	30	1	70.90	70.90	1.3282	3	5	1	4	3	18
54.65		1.6782	1	5	1	29		78	71.47	71.48	1.3189	3	1	2	3	3	13

Table A.2. (continued)

Table A.3. Simulated X-ray powder pattern for $\text{Ca}_{0.2}\text{Sr}_{1.8}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
16.93	16.94	5.232	1	1	0	67	73	26	54.78		1.6743	0	6	0	8		21
17.64	17.66	5.023	0	2	0	10	11	4	55.15	55.14	1.6640	3	2	1	4	5	11
22.87	22.88	3.885	1	2	0	5	6	3	55.42	55.42	1.6565	1	1	2	5	6	15
25.48	25.50	3.493	0	0	1	0	0	0	55.68	55.56	1.6495	0	2	2	1	3	3
29.11	29.12	3.065	2	0	0	27	26	24	56.97	56.98	1.6151	1	6	0	0	0	0
30.39	30.40	2.939	1	3	0	79	82	78	57.84	57.84	1.5928	1	2	2	1	1	2
30.47		2.931	2	1	0	7		7	58.16	58.16	1.5849	3	4	0	3	2	7
30.75	30.76	2.905	1	1	1	100	100	100	59.16	59.16	1.5604	3	3	1	8	7	25
31.17	31.18	2.868	0	2	1	44	45	45	60.36	60.36	1.5323	4	0	0	1	1	3
34.25	34.26	2.616	2	2	0	7	6	8	61.02	61.02	1.5173	2	0	2	6	6	21
34.50		2.597	1	2	1	1		1	61.13	61.16	1.5148	4	1	0	2	5	6
35.72	35.72	2.511	0	4	0	8	7	10	61.16		1.5141	2	5	1	1		3
38.72	38.72	2.324	1	4	0	7	6	10	61.36		1.5098	0	6	1	1		2
39.07	39.08	2.304	2	0	1	6	6	9	61.74	61.74	1.5012	1	3	2	19	16	61
40.07	40.14	2.249	1	3	1	1	16	1	61.79		1.5003	2	1	2	2		6
40.13		2.245	2	1	1	17		27	63.24	63.24	1.4693	2	6	0	6	6	22
43.17	43.18	2.094	2	2	1	45	40	80	63.41	63.42	1.4657	4	2	0	6	7	19
44.39	44.40	2.039	0	4	1	12	11	22	64.06	64.06	1.4524	2	2	2	2	2	8
45.25	45.26	2.002	3	1	0	7	6	13	64.52	64.52	1.4432	3	4	1	3	2	9
46.73	46.72	1.9425	2	4	0	7	6	13	64.99	65.02	1.4338	0	4	2	2	3	8
46.92	46.86	1.9348	1	4	1	3	5	6	65.06		1.4325	3	5	0	2		7
47.59	47.60	1.9092	1	5	0	2	2	4	66.59	66.60	1.4032	4	0	1	3	3	12
47.89	48.04	1.8979	2	3	1	1	4	1	66.91	66.92	1.3973	1	7	0	3	3	10
48.04		1.8926	3	2	0	4		9	66.98		1.3961	1	4	2	2		6
52.35	52.36	1.7463	0	0	2	13	15	32	67.12	67.10	1.3934	4	3	0	0	2	1
52.42		1.7441	3	3	0	8		19	67.32	67.32	1.3897	4	1	1	2	2	8
52.65	52.64	1.7370	3	1	1	13	14	33	69.33	69.34	1.3543	2	6	1	1	2	6
53.97	53.98	1.6976	2	4	1	13	11	34	69.50	69.50	1.3515	4	2	1	3	3	12
54.57	54.76	1.6802	2	5	0	0	30	1	71.07	71.06	1.3254	3	5	1	4	3	18
54.75		1.6752	1	5	1	29		77	71.65	71.66	1.3160	3	1	2	3	3	14

Table A.3 (continued)

Table A.4. Simulated X-ray powder pattern for $\text{Ca}_{0.3}\text{Sr}_{1.7}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
16.97	16.98	5.220	1	1	0	69	76	27	54.88		1.6715	0	6	0	8		21
17.67	17.68	5.014	0	2	0	11	12	4	55.29	55.30	1.6601	3	2	1	4	5	11
22.92	22.92	3.877	1	2	0	5	5	3	55.53	55.54	1.6534	1	1	2	6	6	15
25.53	25.54	3.486	0	0	1	1	1	0	55.79	55.68	1.6465	0	2	2	1	4	3
29.19	29.20	3.057	2	0	0	26	26	24	57.08	57.08	1.6123	1	6	0	0	0	0
30.45	30.46	2.933	1	3	0	79	81	77	57.96	57.96	1.5899	1	2	2	1	1	2
30.55		2.924	2	1	0	7		7	58.30	58.30	1.5813	3	4	0	2	2	7
30.82	30.82	2.899	1	1	1	100	100	100	59.31	59.32	1.5568	3	3	1	9	7	26
31.22	31.22	2.863	0	2	1	44	45	45	60.53	60.54	1.5283	4	0	0	1	1	3
34.33	34.34	2.610	2	2	0	7	7	9	61.15	61.16	1.5142	2	0	2	6	6	20
34.57		2.592	1	2	1	0		1	61.29	61.32	1.5112	2	5	1	1	5	3
35.78	35.78	2.507	0	4	0	8	7	10	61.31		1.5108	4	1	0	2	6	
38.79	38.80	2.320	1	4	0	7	6	10	61.47	61.46	1.5072	0	6	1	1	3	2
39.16	39.16	2.298	2	0	1	6	6	9	61.87	61.86	1.4985	1	3	2	19	16	60
40.14	40.22	2.244	1	3	1	1	16	2	61.92		1.4973	2	1	2	2		6
40.22		2.240	2	1	1	17		26	63.37	63.38	1.4665	2	6	0	6	6	22
43.27	43.28	2.089	2	2	1	45	40	80	63.60	63.58	1.4619	4	2	0	6	7	19
44.47	44.48	2.036	0	4	1	12	11	23	64.20	64.20	1.4496	2	2	2	3	2	9
45.38	45.38	1.9969	3	1	0	7	6	13	64.67	64.68	1.4401	3	4	1	3	2	9
46.83	46.84	1.9385	2	4	0	7	6	14	65.12	65.14	1.4313	0	4	2	2	3	9
47.01	46.96	1.9313	1	4	1	3	5	6	65.21	65.20	1.4295	3	5	0	2	3	7
47.68	47.68	1.9058	1	5	0	2	2	4	66.78	66.78	1.3997	4	0	1	3	3	12
48.00	48.16	1.8939	2	3	1	1	4	1	67.04	67.04	1.3949	1	7	0	3	4	11
48.16		1.8878	3	2	0	4		9	67.11		1.3936	1	4	2	2		6
52.45	52.46	1.7432	0	0	2	13	13	32	67.31	67.22	1.3899	4	3	0	0	2	1
52.55	52.56	1.7399	3	3	0	8	14	20	67.51	67.52	1.3863	4	1	1	2	2	8
52.79	52.78	1.7328	3	1	1	13	13	33	69.48	69.48	1.3518	2	6	1	2	1	6
54.09	54.08	1.6942	2	4	1	13	11	35	69.69	69.68	1.3482	4	2	1	3	3	13
54.69	54.86	1.6769	2	5	0	0	30	1	71.24	71.24	1.3226	3	5	1	4	3	18
54.86		1.6723	1	5	1	29		71.83	71.82	1.3132	3	1	2	3	3	14	

Table A.4. (continued)

Table A.5. Simulated X-ray powder pattern for $\text{Ca}_{0.4}\text{Sr}_{1.6}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.01	17.02	5.207	1	1	0	72	79	28	54.98		1.6687	0	6	0	8		20
17.70	17.72	5.006	0	2	0	12	13	5	55.44	55.44	1.6561	3	2	1	4	5	10
22.97	22.98	3.869	1	2	0	5	5	3	55.65	55.64	1.6504	1	1	2	6	6	16
25.58	25.58	3.480	0	0	1	1	1	0	55.89	55.80	1.6436	0	2	2	1	4	3
29.27	29.28	3.048	2	0	0	26	26	24	57.19	57.18	1.6095	1	6	0	0	0	0
30.51	30.52	2.927	1	3	0	78	79	76	58.08	58.08	1.5870	1	2	2	1	1	2
30.63		2.916	2	1	0	6		6	58.45	58.46	1.5777	3	4	0	2	2	7
30.88	30.88	2.893	1	1	1	100	100	100	59.46	59.46	1.5533	3	3	1	9	7	26
31.28	31.28	2.858	0	2	1	43	45	44	60.71	60.72	1.5242	4	0	0	1	1	3
34.42	34.42	2.604	2	2	0	8	7	9	61.29	61.30	1.5112	2	0	2	6	6	20
34.64		2.587	1	2	1	0		0	61.42	61.46	1.5083	2	5	1	1	5	3
35.85	35.86	2.503	0	4	0	8	8	11	61.49		1.5068	4	1	0	2		5
38.86	38.86	2.316	1	4	0	6	6	9	61.59		1.5047	0	6	1	1		2
39.26	39.26	2.293	2	0	1	6	6	10	61.99	62.00	1.4958	1	3	2	18	16	60
40.22	40.32	2.240	1	3	1	1	16	2	62.06		1.4943	2	1	2	2		6
40.32		2.235	2	1	1	16		25	63.51	63.50	1.4637	2	6	0	6	5	21
43.37	43.38	2.085	2	2	1	45	40	80	63.78	63.78	1.4581	4	2	0	6	5	19
44.55	44.56	2.032	0	4	1	12	11	23	64.34	64.34	1.4467	2	2	2	3	2	9
45.51	45.50	1.9917	3	1	0	7	6	13	64.83	64.84	1.4370	3	4	1	2	2	8
46.93	46.94	1.9345	2	4	0	7	6	14	65.25	65.26	1.4288	0	4	2	2	2	9
47.10	47.06	1.9278	1	4	1	3	5	5	65.37	65.38	1.4264	3	5	0	2	3	7
47.77	47.78	1.9025	1	5	0	2	2	4	66.97	66.98	1.3962	4	0	1	3	3	12
48.10	48.30	1.8900	2	3	1	1	4	1	67.17	67.18	1.3925	1	7	0	3	4	11
48.29		1.8830	3	2	0	4		9	67.25		1.3911	1	4	2	2		6
52.55	52.56	1.7401	0	0	2	13	12	31	67.50	67.34	1.3865	4	3	0	0	2	1
52.69	52.68	1.7358	3	3	0	8	14	20	67.71	67.70	1.3828	4	1	1	2	2	7
52.93	52.92	1.7286	3	1	1	13	13	33	69.63	69.62	1.3493	2	6	1	2	1	6
54.20	54.20	1.6908	2	4	1	13	12	35	69.89	69.88	1.3448	4	2	1	3	3	13
54.81	54.96	1.6737	2	5	0	0	30	1	71.41	71.42	1.3198	3	5	1	4	3	18
54.96		1.6693	1	5	1	29		76	72.01	72.00	1.3104	3	1	2	3	3	14

Table A.5. (continued)

Table A.6. Simulated X-ray powder pattern for $\text{Ca}_{0.5}\text{Sr}_{1.5}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.10	17.10	5.182	1	1	0	77	85	30	55.18		1.6631	0	6	0	8		20
17.76	17.78	4.989	0	2	0	14	16	6	55.72	55.72	1.6483	3	2	1	4	5	9
23.07	23.08	3.853	1	2	0	5	5	3	55.87	55.86	1.6443	1	1	2	6	7	17
25.67	25.68	3.468	0	0	1	1	1	1	56.11	56.02	1.6378	0	2	2	1	4	4
29.43	29.44	3.032	2	0	0	26	26	23	58.31	58.32	1.5812	1	2	2	1	1	2
30.63	30.64	2.916	1	3	0	76	78	75	58.74	58.74	1.5705	3	4	0	2	2	6
30.80		2.901	2	1	0	6		6	59.76	59.76	1.5462	3	3	1	9	7	27
31.00	31.02	2.882	1	1	1	100	100	100	61.07	61.08	1.5160	4	0	0	1	1	3
31.39	31.40	2.848	0	2	1	43	45	43	61.56	61.56	1.5052	2	0	2	6	6	20
34.59	34.60	2.591	2	2	0	8	8	10	61.69	61.72	1.5025	2	5	1	1	4	3
34.78		2.578	1	2	1	0		0	61.82		1.4996	0	6	1	1		3
35.97	35.98	2.495	0	4	0	9	8	11	61.85	61.82	1.4989	4	1	0	1	4	5
39.01	39.02	2.307	1	4	0	6	6	9	62.24	62.24	1.4904	1	3	2	18	15	58
39.44	39.44	2.283	2	0	1	7	7	11	62.34		1.4883	2	1	2	2		5
40.38	40.50	2.232	1	3	1	2	15	3	63.78	63.78	1.4582	2	6	0	6	5	21
40.51		2.225	2	1	1	15		24	64.15	64.16	1.4506	4	2	0	6	5	19
43.57	43.58	2.076	2	2	1	45	40	80	64.63	64.62	1.4410	2	2	2	3	3	10
44.71	44.72	2.025	0	4	1	12	11	23	65.15	65.16	1.4307	3	4	1	2	2	7
45.76	45.76	1.9812	3	1	0	7	6	13	65.51	65.50	1.4238	0	4	2	3	2	9
47.14	47.14	1.9265	2	4	0	7	7	14	65.69	65.70	1.4202	3	5	0	2	3	8
47.28	47.26	1.9208	1	4	1	2	6	5	67.36	67.42	1.3891	4	0	1	3	4	12
47.95	47.96	1.8957	1	5	0	2	2	5	67.43		1.3877	1	7	0	3		11
48.32	48.32	1.8821	2	3	1	1	1	1	67.52	67.52	1.3861	1	4	2	1	4	5
48.56	48.56	1.8735	3	2	0	4	3	8	67.89		1.3795	4	3	0	0		1
52.75	52.76	1.7339	0	0	2	12	12	31	68.09	68.10	1.3758	4	1	1	2	2	6
52.96	52.96	1.7274	3	3	0	8	11	20	69.93	69.92	1.3442	2	6	1	2	2	7
53.20	53.20	1.7202	3	1	1	14	13	34	70.29	70.28	1.3382	4	2	1	3	3	14
54.44	54.44	1.6840	2	4	1	14	12	35	71.76	71.76	1.3143	3	5	1	4	4	18
55.04	55.18	1.6671	2	5	0	0	31	1	72.37	72.36	1.3048	3	1	2	3	3	14
55.17		1.6634	1	5	1	28		74	72.96	72.96	1.2956	4	4	0	2	2	10

Table A.6. (continued)

Table A.7. Simulated X-ray powder pattern for $\text{Ca}_{0.6}\text{Sr}_{1.4}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.10	17.10	5.182	1	1	0	77	85	30	55.18		1.6631	0	6	0	8		20
17.76	17.78	4.989	0	2	0	14	16	6	55.72	55.72	1.6483	3	2	1	4	5	9
23.07	23.08	3.853	1	2	0	5	5	3	55.87	55.86	1.6443	1	1	2	6	7	17
25.67	25.68	3.468	0	0	1	1	1	1	56.11	56.02	1.6378	0	2	2	1	4	4
29.43	29.44	3.032	2	0	0	26	26	23	58.31	58.32	1.5812	1	2	2	1	1	2
30.63	30.64	2.916	1	3	0	76	78	75	58.74	58.74	1.5705	3	4	0	2	2	6
30.80		2.901	2	1	0	6		6	59.76	59.76	1.5462	3	3	1	9	7	27
31.00	31.02	2.882	1	1	1	100	100	100	61.07	61.08	1.5160	4	0	0	1	1	3
31.39	31.40	2.848	0	2	1	43	45	43	61.56	61.56	1.5052	2	0	2	6	6	20
34.59	34.60	2.591	2	2	0	8	8	10	61.69	61.72	1.5025	2	5	1	1	4	3
34.78		2.578	1	2	1	0		0	61.82		1.4996	0	6	1	1		3
35.97	35.98	2.495	0	4	0	9	8	11	61.85	61.82	1.4989	4	1	0	1	4	5
39.01	39.02	2.307	1	4	0	6	6	9	62.24	62.24	1.4904	1	3	2	18	15	58
39.44	39.44	2.283	2	0	1	7	7	11	62.34		1.4883	2	1	2	2		5
40.38	40.50	2.232	1	3	1	2	15	3	63.78	63.78	1.4582	2	6	0	6	5	21
40.51		2.225	2	1	1	15		24	64.15	64.16	1.4506	4	2	0	6	5	19
43.57	43.58	2.076	2	2	1	45	40	80	64.63	64.62	1.4410	2	2	2	3	3	10
44.71	44.72	2.025	0	4	1	12	11	23	65.15	65.16	1.4307	3	4	1	2	2	7
45.76	45.76	1.9812	3	1	0	7	6	13	65.51	65.50	1.4238	0	4	2	3	2	9
47.14	47.14	1.9265	2	4	0	7	7	14	65.69	65.70	1.4202	3	5	0	2	3	8
47.28	47.26	1.9208	1	4	1	2	6	5	67.36	67.42	1.3891	4	0	1	3	4	12
47.95	47.96	1.8957	1	5	0	2	2	5	67.43		1.3877	1	7	0	3		11
48.32	48.32	1.8821	2	3	1	1	1	1	67.52	57.52	1.3861	1	4	2	1	4	5
48.56	48.56	1.8735	3	2	0	4	3	8	67.89		1.3795	4	3	0	0		1
52.75	52.76	1.7339	0	0	2	12	12	31	68.09	68.10	1.3758	4	1	1	2	2	6
52.96	52.96	1.7274	3	3	0	8	11	20	69.93	69.92	1.3442	2	6	1	2	2	7
53.20	53.20	1.7202	3	1	1	14	13	34	70.29	70.28	1.3382	4	2	1	3	3	14
54.44	54.44	1.6840	2	4	1	14	12	35	71.76	71.76	1.3143	3	5	1	4	4	18
55.04	55.18	1.6671	2	5	0	0	31	1	72.37	72.36	1.3048	3	1	2	3	3	14
55.17		1.6634	1	5	1	28		74	72.96	72.96	1.2956	4	4	0	2	2	10

Table A.7. (continued)

Table A.8. Simulated X-ray powder pattern for $\text{Ca}_{0.7}\text{Sr}_{1.3}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.14	17.14	5.170	1	1	0	80	87	31	55.28		1.6603	0	6	0	7	20	
17.79	17.80	4.981	0	2	0	15	17	6	55.87	55.98	1.6444	3	2	1	3	7	9
23.11	23.12	3.845	1	2	0	4	4	3	55.98		1.6413	1	1	2	6		17
25.71	25.72	3.462	0	0	1	1	1	1	56.22	56.12	1.6349	0	2	2	2	4	4
29.52	29.52	3.024	2	0	0	25	25	23	58.43	58.42	1.5783	1	2	2	1	1	2
30.69	30.70	2.911	1	3	0	75	76	74	58.89	58.90	1.5670	3	4	0	2	2	6
30.88		2.894	2	1	0	5		5	59.91	59.92	1.5427	3	3	1	9	7	28
31.07	31.08	2.876	1	1	1	100	100	100	61.26	61.26	1.5120	4	0	0	1	1	3
31.45	31.46	2.843	0	2	1	42	44	43	61.70	61.70	1.5021	2	0	2	6	6	20
34.68	34.68	2.585	2	2	0	9	8	10	61.82		1.4995	2	5	1	1		2
34.85		2.573	1	2	1	0		0	61.93	61.86	1.4970	0	6	1	1	4	3
36.03	36.04	2.491	0	4	0	9	8	11	62.04	62.02	1.4949	4	1	0	1	3	5
39.08	39.08	2.303	1	4	0	6	6	9	62.37	62.36	1.4877	1	3	2	18	15	57
39.54	39.54	2.277	2	0	1	8	7	11	62.48		1.4854	2	1	2	1		5
40.46	40.60	2.228	1	3	1	2	14	3	63.91	63.92	1.4554	2	6	0	6	5	21
40.60		2.220	2	1	1	15		23	64.34	64.34	1.4468	4	2	0	6	5	19
43.67	43.68	2.071	2	2	1	45	40	80	64.77	64.78	1.4382	2	2	2	3	3	10
44.79	44.80	2.022	0	4	1	13	11	23	65.31	65.32	1.4275	3	4	1	2	2	7
45.89	45.90	1.9759	3	1	0	7	6	14	65.64	65.64	1.4213	0	4	2	3	2	9
47.24	47.24	1.9224	2	4	0	7	7	15	65.85	65.84	1.4171	3	5	0	2	3	8
47.38	47.36	1.9174	1	4	1	2	6	5	67.55	67.56	1.3856	4	0	1	3	5	12
48.04	48.04	1.8924	1	5	0	3	2	5	67.57		1.3853	1	7	0	3		11
48.43	48.44	1.8781	2	3	1	1	1	1	67.66		1.3836	1	4	2	1		5
48.69	48.68	1.8687	3	2	0	4	3	8	68.08	68.08	1.3761	4	3	0	0	0	1
52.85	52.86	1.7308	0	0	2	12	11	30	68.29	68.30	1.3724	4	1	1	2	1	6
53.10	53.10	1.7233	3	3	0	8	10	20	70.08	70.08	1.3416	2	6	1	2	2	7
53.34	53.34	1.7160	3	1	1	14	13	34	70.49	70.48	1.3349	4	2	1	3	3	14
54.56	54.56	1.6807	2	4	1	14	12	36	71.94	71.94	1.3115	3	5	1	4	4	18
55.16	55.28	1.6637	2	5	0	0	30	1	72.55	72.54	1.3019	3	1	2	3	3	15
55.28		1.6605	1	5	1	28		74	73.17	73.16	1.2924	4	4	0	2	2	10

Table A.8. (continued)

20	Peak	d	h	k	ℓ	I(INT)	I(PK)	I(DS)	20	Peak	d	h	k	ℓ	I(INT)	I(PK)	I(DS)	
73.48	73.58	1.2877	2	7	0	1	6	2	87.88	87.88	1.1100	4	2	2	4	4	23	
73.58		1.2863	2	4	2	3		15	88.68	88.68	1.1021	3	7	1	2	2	14	
73.59		1.2861	1	7	1	3		15	89.26	89.26	1.0965	3	5	2	2	2	11	
73.89	73.80	1.2816	3	6	0	0	3	2	89.66	89.66	1.0926	2	8	1	4	3	25	
74.08	74.18	1.2787	4	3	1	0	1	1										
	74.19		1.2772	1	5	2	1			74.19		1.2772	1	5	2			
74.69	74.70	1.2698	3	2	2	1	1	7	74.69	74.70	1.2698	3	2	2	1			
78.22	78.22	1.2212	3	3	2	4	3	21	78.22	78.22	1.2212	3	3	2	4			
79.02	79.02	1.2108	4	4	1	3	2	14	79.02	79.02	1.2108	4	4	1	3			
79.32	79.30	1.2069	2	7	1	2	2	7	79.32	79.30	1.2069	2	7	1	2			
	79.52	79.56	1.2044	4	5	0	0	1	2	79.52	79.56	1.2044	4	5	0	0	1	2
79.72	79.80	1.2019	3	6	1	1	3	3	79.72	79.80	1.2019	3	6	1	1	3	3	
79.81		1.2008	5	1	0	3		13	79.81		1.2008	5	1	0	3		13	
79.91	80.02	1.1995	2	5	2	0	5	1	79.91	80.02	1.1995	2	5	2	0	5	1	
80.02		1.1982	0	6	2	4		21	80.02		1.1982	0	6	2	4		21	
	81.89	82.20	1.1754	5	2	0	0	3	1	81.89	82.20	1.1754	5	2	0	0	3	1
82.20		1.1718	0	8	1	4		21	82.20		1.1718	0	8	1	4		21	
82.99	83.00	1.1626	3	7	0	2	2	9	82.99	83.00	1.1626	3	7	0	2	2	9	
83.08		1.1616	3	4	2		1	7	83.08		1.1616	3	4	2		1	7	
83.98	83.98	1.1515	2	8	0	1	1	4	83.98	83.98	1.1515	2	8	0	1	1	4	
	85.14	85.14	1.1387	4	0	2	1	1	4	85.14	85.14	1.1387	4	0	2	1	1	4
85.24	85.24	1.1375	4	5	1	0	1	3	85.24	85.24	1.1375	4	5	1	0	1	3	
85.34	85.54	1.1365	5	3	0	0	1	2	85.34	85.54	1.1365	5	3	0	0	1	2	
85.53		1.1344	5	1	1	1		7	85.53		1.1344	5	1	1	1		7	
85.83	85.82	1.1313	4	1	2	1	1	5	85.83	85.82	1.1313	4	1	2	1	1	5	
	86.32	86.32	1.1262	1	1	3	4	3	24	86.32	86.32	1.1262	1	1	3	4	3	24
86.51	86.54	1.1241	0	2	3	2	3	13	86.51	86.54	1.1241	0	2	3	2	3	13	
87.11	87.12	1.1179	4	6	0	1	1	4	87.11	87.12	1.1179	4	6	0	1	1	4	
87.50	87.50	1.1139	2	6	2	5	4	27	87.50	87.50	1.1139	2	6	2	5	4	27	
87.59		1.1130	5	2	1	0		2	87.59		1.1130	5	2	1	0		2	

Table A.9. Simulated X-ray powder pattern for Ca_{0.8}Sr_{1.2}PbO₄

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.18	17.20	5.157	1	1	0	83	89	32	55.39		1.6575	1	5	1	28		73
17.82	17.84	4.973	0	2	0	16	18	6	56.01	56.10	1.6405	3	2	1	3	7	9
23.16	23.18	3.837	1	2	0	4	4	3	56.10		1.6382	1	1	2	7		18
25.76	25.78	3.455	0	0	1	2	2	1	56.33	56.24	1.6320	0	2	2	2	5	4
29.60	29.60	3.016	2	0	0	25	25	23	58.55	58.54	1.5754	1	2	2	1	0	2
30.75	30.76	2.905	1	3	0	74	75	73	59.04	59.04	1.5634	3	4	0	2	2	5
30.96	31.14	2.886	2	1	0	5	100	5	60.06	60.06	1.5391	3	3	1	9	8	28
31.13		2.871	1	1	1	100		100	61.44	61.44	1.5079	4	0	0	1	1	3
31.50	31.50	2.838	0	2	1	42	44	42	61.84	61.84	1.4991	2	0	2	6	5	20
34.76	34.76	2.579	2	2	0	9	8	11	61.95		1.4966	2	5	1	1		2
34.92		2.568	1	2	1	0		0	62.05	62.02	1.4945	0	6	1	1	4	3
36.10	36.10	2.486	0	4	0	9	8	12	62.22	62.22	1.4909	4	1	0	1	3	4
39.16	39.16	2.299	1	4	0	6	6	9	62.49	62.50	1.4850	1	3	2	17	15	56
39.63	39.64	2.272	2	0	1	8	7	12	62.62		1.4824	2	1	2	1		4
40.54	40.70	2.224	1	3	1	2	13	4	64.05	64.06	1.4526	2	6	0	6	5	21
40.70		2.215	2	1	1	14		22	64.53	64.52	1.4430	4	2	0	5	5	19
43.77	43.78	2.067	2	2	1	45	39	80	64.92	64.92	1.4353	2	2	2	3	3	11
44.88	44.88	2.018	0	4	1	13	11	23	65.48	65.48	1.4244	3	4	1	2	2	6
46.02	46.02	1.9707	3	1	0	7	6	14	65.77	65.76	1.4188	0	4	2	3	3	9
47.35	47.36	1.9184	2	4	0	7	7	15	66.02	66.00	1.4140	3	5	0	2	2	8
47.47	47.46	1.9139	1	4	1	2	6	4	67.70	67.74	1.3829	1	7	0	3	5	11
48.13	48.14	1.8890	1	5	0	3	3	6	67.75		1.3820	4	0	1	3		12
48.54	48.54	1.8742	2	3	1	0	1	1	67.80		1.3811	1	4	2		1	5
48.82	48.82	1.8639	3	2	0	3	3	7	68.28	68.28	1.3726	4	3	0	0	0	1
52.96	52.96	1.7277	0	0	2	12	11	30	68.49	68.48	1.3689	4	1	1	1	1	6
53.24	53.24	1.7191	3	3	0	8	9	20	70.23	70.24	1.3391	2	6	1	2	2	8
53.49	53.48	1.7118	3	1	1	14	13	35	70.69	70.68	1.3316	4	2	1	4	3	14
54.68	54.68	1.6773	2	4	1	14	12	36	72.12	72.12	1.3087	3	5	1	4	4	18
55.28	55.38	1.6604	2	5	0	0	29	1	72.73	72.74	1.2991	3	1	2	3	3	15
55.38		1.6576	0	6	0	7		20	73.37	73.38	1.2893	4	4	0	2	2	10

Table A.9. (continued)

Table A.10. Simulated X-ray powder pattern for $\text{Ca}_{0.9}\text{Sr}_{1.1}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.22	17.24	5.145	1	1	0	85	92	33	55.49		1.6545	1	5	1	27		72
17.85	17.86	4.964	0	2	0	17	19	7	56.16	56.20	1.6366	3	2	1	3	8	8
23.21	23.22	3.829	1	2	0	4	4	2	56.21		1.6352	1	1	2	7		19
25.81	25.82	3.449	0	0	1	2	2	1	56.44	56.34	1.6291	0	2	2	2	5	5
29.68	29.68	3.008	2	0	0	25	24	23	58.66	58.66	1.5724	1	2	2	0	0	1
30.81	30.82	2.900	1	3	0	73	73	72	59.19	59.20	1.5598	3	4	0	2	1	5
31.04	31.20	2.878	2	1	0	5	100	5	60.22	60.22	1.5356	3	3	1	9	8	28
31.19		2.865	1	1	1	100		100	61.62	61.62	1.5038	4	0	0	1	1	3
31.56	31.56	2.833	0	2	1	41	43	42	61.98	61.98	1.4961	2	0	2	6	5	19
34.85	34.86	2.572	2	2	0	9	9	11	62.09	62.14	1.4937	2	5	1	1	4	2
34.99		2.563	1	2	1	0		0	62.17		1.4920	0	6	1	1		4
36.16	36.16	2.482	0	4	0	9	9	12	62.41	62.62	1.4869	4	1	0	1	15	4
39.23	39.24	2.295	1	4	0	6	5	8	62.62		1.4822	1	3	2	17		56
39.73	39.74	2.267	2	0	1	8	8	12	62.76	62.78	1.4794	2	1	2	1	9	4
40.61	40.80	2.220	1	3	1	3	13	4	64.19	64.18	1.4498	2	6	0	6	5	21
40.80		2.210	2	1	1	14		21	64.72	64.72	1.4392	4	2	0	5	5	19
43.87	43.88	2.062	2	2	1	45	39	80	65.06	65.06	1.4325	2	2	2	3	3	11
44.96	44.96	2.015	0	4	1	13	11	23	65.64	65.64	1.4212	3	4	1	2	2	6
46.15	46.16	1.9654	3	1	0	7	6	14	65.90	65.90	1.4163	0	4	2	3	3	10
47.45	47.46	1.9144	2	4	0	7	7	15	66.18	66.18	1.4109	3	5	0	2	2	8
47.56	47.56	1.9104	1	4	1	2	6	4	67.83	67.94	1.3805	1	7	0	3	5	11
48.22	48.22	1.8857	1	5	0	3	3	6	67.94		1.3786	1	4	2		1	5
48.65	48.64	1.8702	2	3	1	0	1	1	67.94		1.3785	4	0	1	3		12
48.95	48.96	1.8592	3	2	0	3	3	7	68.48	68.48	1.3691	4	3	0	0	0	1
53.06	53.06	1.7246	0	0	2	12	11	29	68.69	68.68	1.3654	4	1	1	1	1	5
53.38	53.38	1.7149	3	3	0	8	9	20	70.39	70.38	1.3366	2	6	1	2	2	8
53.63	53.62	1.7076	3	1	1	14	13	35	70.89	70.90	1.3282	4	2	1	4	3	15
54.80	54.80	1.6739	2	4	1	14	12	36	72.29	72.30	1.3059	3	5	1	4	4	19
55.40	55.50	1.6571	2	5	0	0	29	1	72.92	72.92	1.2963	3	1	2	4	3	15
55.48		1.6548	0	6	0	7		19	73.58	73.58	1.2862	4	4	0	2	2	10

Table A.10. (continued)

Table A.11. Simulated X-ray powder pattern for CaSrPbO₄

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.26	17.28	5.132	1	1	0	88	96	34	55.60		1.6516	1	5	1	27		72
17.88	17.90	4.956	0	2	0	18	21	7	56.30	56.32	1.6327	3	2	1	3	9	8
23.26	23.28	3.821	1	2	0	4	4	2	56.32		1.6321	1	1	2	7		19
25.86	25.86	3.443	0	0	1	2	2	2	56.55	56.46	1.6262	0	2	2	2	6	5
29.76	29.76	3.000	2	0	0	25	24	23	58.78	58.78	1.5695	1	2	2	0	0	1
30.87	30.88	2.894	1	3	0	73	72	71	59.34	59.34	1.5562	3	4	0	2	1	5
31.13	31.26	2.871	2	1	0	4	100	4	60.37	60.38	1.5320	3	3	1	9	8	29
31.26		2.859	1	1	1	100		100	61.81	61.82	1.4998	4	0	0	1	1	4
31.62	31.62	2.828	0	2	1	41	43	42	62.12	62.12	1.4931	2	0	2	6	5	19
34.94	34.94	2.566	2	2	0	10	9	11	62.22	62.28	1.4908	2	5	1	1	5	2
35.06		2.558	1	2	1	0		0	62.29		1.4894	0	6	1	1		4
36.22	36.22	2.478	0	4	0	9	9	12	62.59	62.76	1.4829	4	1	0	1	14	4
39.31	39.32	2.290	1	4	0	6	5	8	62.75		1.4795	1	3	2	17		55
39.83	39.84	2.262	2	0	1	9	8	13	62.90	62.92	1.4764	2	1	2	1	9	4
40.69	40.70	2.215	1	3	1	3	4	5	64.33	64.32	1.4470	2	6	0	6	5	21
40.90	40.90	2.205	2	1	1	13	12	20	64.91	64.90	1.4355	4	2	0	5	5	19
43.97	43.98	2.058	2	2	1	45	40	80	65.21	65.20	1.4296	2	2	2	3	3	11
45.04	45.04	2.011	0	4	1	13	11	23	65.80	65.80	1.4181	3	4	1	2	2	5
46.28	46.28	1.9602	3	1	0	7	6	14	66.03	66.02	1.4138	0	4	2	3	3	10
47.56	47.56	1.9104	2	4	0	8	7	15	66.34	66.34	1.4078	3	5	0	2	2	8
47.65	47.66	1.9069	1	4	1	2	6	4	67.97	67.98	1.3781	1	7	0	3	3	11
48.31	48.32	1.8823	1	5	0	3	3	7	68.08	68.14	1.3761	1	4	2	1	4	5
48.76	48.76	1.8663	2	3	1	0	1	1	68.14		1.3750	4	0	1	3		12
49.09	49.08	1.8544	3	2	0	3	3	7	68.67	68.68	1.3656	4	3	0	0	0	1
53.16	53.16	1.7215	0	0	2	12	10	29	68.89	68.88	1.3619	4	1	1	1	1	5
53.52	53.52	1.7107	3	3	0	8	8	20	70.54	70.54	1.3340	2	6	1	2	2	9
53.77	53.76	1.7035	3	1	1	14	13	35	71.10	71.10	1.3249	4	2	1	4	3	15
54.92	54.92	1.6705	2	4	1	14	12	36	72.47	72.48	1.3031	3	5	1	4	4	19
55.52	55.60	1.6538	2	5	0	0	29	1	73.10	73.10	1.2935	3	1	2	4	3	15
55.59		1.6520	0	6	0	7		19	73.79	73.80	1.2831	4	4	0	2	2	10

Table A.11. (continued)

Table A.12. Simulated X-ray powder pattern for $\text{Ca}_{1.1}\text{Sr}_{0.9}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.31	17.32	5.120	1	1	0	91	100	35	56.44	56.44	1.6291	1	1	2	7	9	20
17.91	17.92	4.948	0	2	0	20	22	8	56.45		1.6287	3	2	1	3		7
23.31	23.32	3.813	1	2	0	4	4	2	56.66	56.60	1.6233	0	2	2	2	6	5
25.90	25.92	3.437	0	0	1	3	3	2	58.90	58.90	1.5666	1	2	2	0	0	1
29.84	29.86	2.991	2	0	0	24	24	23	59.49	59.50	1.5526	3	4	0	2	1	4
30.93	30.94	2.889	1	3	0	72	72	70	60.52	60.52	1.5285	3	3	1	10	8	29
31.21	31.32	2.863	2	1	0	4	100	4	62.00	62.00	1.4957	4	0	0	1	1	4
31.32		2.853	1	1	1	100		100	62.26	62.26	1.4900	2	0	2	6	6	19
31.67	31.68	2.823	0	2	1	40	43	41	62.36		1.4878	2	5	1	1		2
35.03	35.04	2.560	2	2	0	10	9	12	62.40	62.42	1.4869	0	6	1	1	5	4
36.28	36.28	2.474	0	4	0	10	9	12	62.78	62.88	1.4789	4	1	0	1	14	4
39.38	39.38	2.286	1	4	0	6	5	8	62.88		1.47681	3	2	17	54		
39.92	39.92	2.256	2	0	1	9	8	14	63.04	63.04	1.4734	2	1	2	1	9	3
40.77	40.78	2.211	1	3	1	4	4	6	64.46	64.46	1.4443	2	6	0	6	5	21
40.99	41.00	2.200	2	1	1	12	12	20	65.10	65.10	1.4317	4	2	0	5	5	19
44.08	44.08	2.053	2	2	1	45	40	80	65.35	65.34	1.4267	2	2	2	3	4	12
45.12	45.12	2.008	0	4	1	13	11	24	65.97	65.98	1.4149	3	4	1	1	2	5
46.41	46.42	1.9549	3	1	0	7	7	14	66.16	66.16	1.4113	0	4	2	3	3	10
47.67	47.68	1.9064	2	4	0	8	7	16	66.51	66.50	1.4047	3	5	0	2	2	8
47.74		1.9035	1	4	1	2		4	68.10	68.10	1.3757	1	7	0	3	3	11
48.41	48.40	1.8789	1	5	0	3	3	7	68.22	68.34	1.3736	1	4	2	1	4	4
48.87	48.86	1.8623	2	3	1	0	1	1	68.34		1.3714	4	0	1	3		12
49.22	49.22	1.8496	3	2	0	3	3	6	68.87	68.88	1.3622	4	3	0	0	0	1
53.26	53.26	1.7184	0	0	2	12	10	29	69.09	69.08	1.3584	4	1	1	1	1	5
53.66	53.66	1.7066	3	3	0	8	8	21	70.69	70.70	1.3315	2	6	1	2	2	9
53.91	53.92	1.6993	3	1	1	14	13	35	71.30	71.30	1.3216	4	2	1	4	3	15
55.04	55.04	1.6671	2	4	1	14	12	37	72.65	72.66	1.3003	3	5	1	5	4	19
55.64	55.70	1.6505	2	5	0	0	28	1	73.29	73.28	1.2907	3	1	2	4	3	15
55.69		1.6492	0	6	0	7		19	74.00	74.02	1.2799	4	4	0	2	3	11
55.71		1.6486	1	5	1	27		71	74.13	74.22	1.2781	2	7	0	0	6	2

Table A.12. (continued)

Table A.13. Simulated X-ray powder pattern for $\text{Ca}_{1.2}\text{Sr}_{0.8}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	-I(INT)	I(PK)	I(DS)
17.35	17.36	5.107	1	1	0	95	100	36	56.55	56.56	1.6260	1	1	2	8	8	20
17.94	17.96	4.939	0	2	0	21	23	9	56.60		1.6248	3	2	1	3		7
23.36	23.38	3.805	1	2	0	3	3	2	56.77	56.72	1.6204	0	2	2	2	6	6
25.95	25.96	3.431	0	0	1	3	3	2	59.02	59.02	1.5637	1	2	2	0	0	1
29.93	29.94	2.983	2	0	0	24	23	22	59.64	59.64	1.5490	3	4	0	1	1	4
30.99	31.00	2.883	1	3	0	71	69	69	60.68	60.68	1.5250	3	3	1	10	8	30
31.30	31.40	2.856	2	1	0	4	97	4	62.19	62.20	1.4916	4	0	0	1	2	4
31.39		2.848	1	1	1	100		100	62.40	62.40	1.4870	2	0	2	6	6	19
31.73	31.74	2.818	0	2	1	40	41	41	62.50		1.4849	2	5	1	1		2
35.11	35.12	2.554	2	2	0	10	9	12	62.52	62.54	1.4843	0	6	1	1	4	4
36.35	36.36	2.470	0	4	0	10	9	13	62.97	63.00	1.4749	4	1	0	1	14	3
39.46	39.46	2.282	1	4	0	5	5	8	63.01		1.4741	1	3	2	16		53
40.02	40.02	2.251	2	0	1	10	8	14	63.18	63.18	1.4704	2	1	2	1	9	3
40.85	40.86	2.207	1	3	1	4	4	6	64.60	64.60	1.4415	2	6	0	6	5	21
41.09	41.10	2.195	2	1	1	12	11	19	65.29	65.30	1.4279	4	2	0	5	5	19
44.18	44.18	2.048	2	2	1	.45	39	80	65.50	65.48	1.4239	2	2	2	3	5	12
45.20	45.20	2.004	0	4	1	13	11	24	66.14	66.14	1.4117	3	4	1	1	2	5
46.54	46.54	1.9497	3	1	0	8	6	15	66.29	66.30	1.4088	0	4	2	3	3	10
47.77	47.78	1.9024	2	4	0	8	7	16	66.67	66.68	1.4016	3	5	0	2	2	8
47.84		1.9000	1	4	1	2		4	68.24	68.24	1.3733	1	7	0	3	3	11
48.50	48.50	1.8756	1	5	0	4	3	8	68.36	68.44	1.3711	1	4	2	1	2	4
48.98	48.98	1.8584	2	3	1	0	1	1	68.54	68.54	1.3679	4	0	1	3	3	12
49.36	49.36	1.8449	3	2	0	3	2	6	69.07	69.08	1.3587	4	3	0	0	0	1
53.37	53.38	1.7153	0	0	2	12	10	28	69.29	69.30	1.3550	4	1	1	1	1	4
53.81	53.80	1.7024	3	3	0	8	8	21	70.85	70.86	1.3289	2	6	1	2	2	9
54.06	54.06	1.6951	3	1	1	14	13	36	71.51	71.52	1.3183	4	2	1	4	3	16
55.16	55.16	1.6637	2	4	1	14	12	37	72.84	72.84	1.2975	3	5	1	5	4	19
55.76	55.82	1.6472	2	5	0	0	27	1	73.47	73.48	1.2878	3	1	2	4	3	16
55.79		1.6464	0	6	0	7		19	74.21	74.40	1.2768	4	4	0	2	5	11
55.82		1.6457	1	5	1	27		70	74.29		1.2757	2	7	0	0		2

Table A.13. (continued)

Table A.14. Simulated X-ray powder pattern for $\text{Ca}_{1.3}\text{Sr}_{0.7}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.39	17.40	5.095	1	1	0	98	100	38	56.67	56.68	1.6230	1	1	2	8	7	21
17.97	17.98	4.931	0	2	0	22	24	9	56.75		1.6209	3	2	1	2	6	
23.41	23.42	3.797	1	2	0	3	3	2	56.88	56.82	1.6175	0	2	2	2	6	6
26.00	26.00	3.424	0	0	1	4	3	3	59.14	59.14	1.5608	1	2	2	0	0	1
30.01	30.02	2.975	2	0	0	24	22	22	59.80	59.80	1.5454	3	4	0	1	1	4
31.06	31.06	2.877	1	3	0	70	66	68	60.84	60.84	1.5214	3	3	1	10	8	30
31.38	31.46	2.848	2	1	0	3	95	3	62.37	62.54	1.4875	4	0	0	1	6	4
31.45		2.842	1	1	1	100		100	62.54		1.4840	2	0	2	6		19
31.79	31.80	2.813	0	2	1	39	40	40	62.63		1.4820	2	5	1	1		2
35.20	35.20	2.547	2	2	0	11	9	13	62.64		1.4818	0	6	1	2		5
36.41	36.42	2.465	0	4	0	10	9	13	63.14	63.14	1.4714	1	3	2	16	13	52
39.53	39.54	2.278	1	4	0	5	5	8	63.16		1.4709	4	1	0	1		3
40.12	40.12	2.246	2	0	1	10	9	15	63.33	63.30	1.4675	2	1	2	1	8	3
40.93	40.94	2.203	1	3	1	5	5	7	64.74	64.74	1.4387	2	6	0	6	5	20
41.19	41.20	2.190	2	1	1	11	10	18	65.49	65.50	1.4241	4	2	0	5	5	19
44.28	44.28	2.044	2	2	1	45	37	80	65.65	65.66	1.4210	2	2	2	4	5	13
45.29	45.28	2.001	0	4	1	13	11	24	66.30	66.42	1.4086	3	4	1	1	3	4
46.68	46.68	1.9444	3	1	0	8	6	15	66.42		1.4063	0	4	2	3		10
47.88	47.88	1.8983	2	4	0	8	7	16	66.84	66.84	1.3986	3	5	0	2	2	9
47.93		1.8965	1	4	1	2		3	68.37	68.38	1.3709	1	7	0	3	3	11
48.59	48.60	1.8722	1	5	0	4	3	8	68.50	68.54	1.3686	1	4	2	1	2	4
49.09	49.08	1.8544	2	3	1	0	0	1	68.75	68.74	1.3644	4	0	1	3	3	12
49.49	49.50	1.8401	3	2	0	3	2	6	69.28	69.28	1.3552	4	3	0	0	0	0
53.47	53.48	1.7122	0	0	2	11	9	28	69.50	69.50	1.3515	4	1	1	1	1	4
53.95	53.96	1.6982	3	3	0	8	8	21	71.01	71.00	1.3264	2	6	1	2	2	10
54.20	54.20	1.6909	3	1	1	14	13	36	71.72	71.72	1.3150	4	2	1	4	3	16
55.29	55.28	1.6603	2	4	1	14	12	37	73.02	73.02	1.2947	3	5	1	5	3	19
55.88	55.92	1.6439	2	5	0	0	25	1	73.66	73.66	1.2850	3	1	2	4	3	16
55.89		1.6437	0	6	0	7		18	74.43	74.50	1.2737	4	4	0	2	5	11
55.93		1.6427	1	5	1	26		70	74.45		1.2733	2	7	0	0		2

Table A.14. (continued)

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
74.49		1.2727	1	7	1	4		17
74.58	74.58	1.2714	2	4	2	4	5	16
74.99	74.98	1.2656	3	6	0	0	1	2
75.13	75.12	1.2635	1	5	2	2	2	8
75.36	75.34	1.2601	4	3	1	0	1	1
75.83	75.84	1.2535	3	2	2	1	1	5
79.41	79.42	1.2057	3	3	2	4	3	22
80.37	80.38	1.1938	4	4	1	3	3	16
80.40		1.1935	2	7	1	1		5
80.87	81.02	1.1876	4	5	0	0	3	1
80.92		1.1871	3	6	1	0		2
81.02		1.1858	2	5	2	0		1
81.03		1.1857	0	6	2	4	20	
81.38	81.38	1.1814	5	1	0	3	2	13
83.23	83.24	1.1599	0	8	1	4	3	19
84.24	84.24	1.1486	3	7	0	2	1	9
84.36	84.34	1.1472	3	4	2	1	1	4
84.88	84.88	1.1415	0	0	3	0	0	1
85.12	85.12	1.1388	2	8	0	1	1	5
86.62	86.64	1.1229	4	0	2	1	1	5
86.71		1.1221	4	5	1	0		2
87.01	87.00	1.1190	5	3	0	1	1	3
87.21	87.22	1.1168	5	1	1	2	2	9
87.32		1.1157	4	1	2	1		4
87.51	87.50	1.1139	1	1	3	4	4	23
87.68	87.68	1.1121	0	2	3	2	2	12
88.60	88.74	1.1029	4	6	0	1	3	5
88.75		1.1015	2	6	2	4		26
89.31	89.42	1.0960	5	2	1	0	3	1
89.42		1.0949	4	2	2	4		24

Table A.15. Simulated X-ray powder pattern for $\text{Ca}_{1.4}\text{Sr}_{0.6}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.44	17.44	5.082	1	1	0	100	100	100	56.78	56.78	1.6199	1	1	2	8	7	56
18.01	18.02	4.923	0	2	0	24	25	25	56.90	56.94	1.6170	3	2	1	2	6	15
23.46	23.48	3.789	1	2	0	3	3	5	56.99		1.6146	0	2	2	2		17
26.05	26.06	3.418	0	0	1	4	4	8	59.27	59.26	1.5579	1	2	2	0	0	3
30.10	30.10	2.967	2	0	0	23	21	56	59.95	59.96	1.5418	3	4	0	1	1	9
31.12	31.12	2.872	1	3	0	68	63	173	60.99	61.00	1.5179	3	3	1	10	7	79
31.47	31.52	2.841	2	1	0	3	92	8	62.57	62.70	1.4835	4	0	0	1	5	10
31.52		2.836	1	1	1	99		256	62.68		1.4810	2	0	2	6		47
31.85	31.86	2.808	0	2	1	39	38	102	62.76		1.4793	0	6	1	2		13
35.29	35.30	2.541	2	2	0	11	9	34	62.77		1.4791	2	5	1	0		4
36.48	36.48	2.461	0	4	0	10	9	34	63.27	63.26	1.4687	1	3	2	16	12	133
39.61	39.62	2.273	1	4	0	5	4	19	63.35		1.4669	4	1	0	1		8
40.22	40.22	2.241	2	0	1	10	9	40	63.47	63.44	1.4645	2	1	2	1	8	7
41.01	41.02	2.199	1	3	1	5	5	20	64.89	64.88	1.4359	2	6	0	6	4	52
41.29	41.30	2.185	2	1	1	11	9	44	65.68	65.70	1.4204	4	2	0	5	5	49
44.39	44.38	2.039	2	2	1	44	36	204	65.80	65.80	1.4182	2	2	2	4	5	34
45.37	45.38	1.9974	0	4	1	13	11	62	66.47	66.56	1.4054	3	4	1	1	3	10
46.81	46.82	1.9392	3	1	0	8	6	39	66.56		1.4038	0	4	2	3		27
47.99	48.00	1.8943	2	4	0	8	7	42	67.01	67.00	1.3955	3	5	0	2	2	22
48.02		1.8930	1	4	1	2		8	68.51	68.52	1.3685	1	7	0	3	2	29
48.68	48.68	1.8688	1	5	0	4	3	22	68.65	68.68	1.3661	1	4	2	1	2	10
49.20	49.20	1.8504	2	3	1	0	0	2	68.95	68.94	1.3608	4	0	1	3	2	30
49.63	49.64	1.8353	3	2	0	3	2	14	69.48	69.48	1.3518	4	3	0	0	0	1
53.58	53.58	1.7091	0	0	2	11	9	71	69.70	69.70	1.3480	4	1	1	1	1	9
54.09	54.10	1.6940	3	3	0	8	7	54	71.16	71.16	1.3238	2	6	1	3	2	27
54.35	54.34	1.6867	3	1	1	14	12	94	71.93	71.92	1.3116	4	2	1	4	3	42
55.41	55.42	1.6569	2	4	1	14	11	97	73.20	73.20	1.2919	3	5	1	5	3	49
56.00	56.04	1.6409	0	6	0	7	24	46	73.85	73.86	1.2822	3	1	2	4	3	41
56.01		1.6406	2	5	0	0		1	74.62	74.64	1.2709	2	7	0	0	6	4
56.04		1.6398	1	5	1	26		177	74.64		1.2705	4	4	0	2		28

Table A.15. (continued)

Table A.16. Simulated X-ray powder pattern for $\text{Ca}_{1.5}\text{Sr}_{0.5}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.48	17.50	5.070	1	1	0	100	100	100	56.90	56.90	1.6169	1	1	2	8	7	56
18.04	18.04	4.914	0	2	0	24	26	26	57.05	57.06	1.6131	3	2	1	2	7	14
23.51	23.52	3.781	1	2	0	3	2	4	57.10		1.6116	0	2	2	2		17
26.10	26.10	3.412	0	0	1	5	4	8	59.39	59.38	1.5550	1	2	2	0	0	2
30.18	30.18	2.959	2	0	0	22	20	54	60.10	60.10	1.5382	3	4	0	1	1	8
31.18	31.18	2.866	1	3	0	65	60	165	61.15	61.16	1.5143	3	3	1	10	7	77
31.55	31.58	2.833	2	1	0	3	89	7	62.76	62.84	1.4794	4	0	0	1	6	10
31.58		2.831	1	1	1	96		248	62.83		1.4779	2	0	2	5		45
31.91	31.90	2.803	0	2	1	37	37	97	62.88		1.4767	0	6	1	2		14
35.38	35.38	2.535	2	2	0	11	10	35	62.91		1.4761	2	5	1	0		4
36.54	36.54	2.457	0	4	0	10	9	33	63.40	63.40	1.4660	1	3	2	15	12	126
39.69	39.70	2.269	1	4	0	5	4	18	63.55	63.56	1.4629	4	1	0	1	7	7
40.31	40.32	2.235	2	0	1	10	9	40	63.61		1.4615	2	1	2	1		6
41.10	41.10	2.195	1	3	1	5	5	22	65.03	65.02	1.4331	2	6	0	6	4	50
41.39	41.40	2.180	2	1	1	10	9	40	65.88	65.90	1.4166	4	2	0	5	6	48
44.49	44.50	2.035	2	2	1	43	35	198	65.95		1.4153	2	2	2	4		34
45.45	45.46	1.9939	0	4	1	13	10	60	66.64	66.68	1.4023	3	4	1	1	3	9
46.94	46.94	1.9339	3	1	0	8	6	38	66.69		1.4013	0	4	2	3		27
48.10	48.10	1.8903	2	4	0	8	7	41	67.18	67.18	1.3924	3	5	0	2	2	22
48.12		1.8895	1	4	1	1		7	68.64	68.64	1.3661	1	7	0	3	2	29
48.78	48.78	1.8655	1	5	0	4	4	23	68.79	68.82	1.3636	1	4	2	1	2	9
49.31	49.32	1.8465	2	3	1	0	0	2	69.16	69.16	1.3573	4	0	1	3	2	29
49.77	49.78	1.8305	3	2	0	2	2	13	69.68	69.68	1.3483	4	3	0	0	0	1
53.68	53.68	1.7060	0	0	2	11	9	68	69.91	69.90	1.3445	4	1	1	1	1	8
54.24	54.24	1.6899	3	3	0	8	7	52	71.32	71.32	1.3213	2	6	1	3	2	27
54.50	54.50	1.6825	3	1	1	14	12	91	72.14	72.14	1.3083	4	2	1	4	3	41
55.53	55.54	1.6535	2	4	1	14	11	94	73.39	73.38	1.2892	3	5	1	4	3	48
56.10	56.14	1.6381	0	6	0	6	23	44	74.04	74.04	1.2794	3	1	2	4	3	40
56.13		1.6373	2	5	0	0		1	74.78	74.86	1.2685	2	7	0	0	5	3
56.15		1.6368	1	5	1	25		169	74.80		1.2683	1	7	1	4		43

Table A.16. (continued)

Table A.17. Simulated X-ray powder pattern for Ca_{1.6}Sr_{0.4}PbO₄

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.52	17.54	5.057	1	1	0	100	100	100	57.02	57.02	1.6139	1	1	2	8	7	56
18.07	18.08	4.906	0	2	0	25	26	26	57.20	57.18	1.6091	3	2	1	2	6	12
23.56	23.58	3.773	1	2	0	2	2	4	57.22		1.6087	0	2	2	2		17
26.14	26.16	3.406	0	0	1	5	4	9	59.51	59.52	1.5521	1	2	2	0	0	2
30.27	30.28	2.951	2	0	0	21	19	52	60.26	60.26	1.5346	3	4	0	1	1	7
31.24	31.24	2.861	1	3	0	62	56	157	61.31	61.32	1.5108	3	3	1	10	7	76
31.64	31.66	2.826	2	1	0	2	86	6	62.95	62.98	1.4753	4	0	0	1	6	10
31.65		2.825	1	1	1	92		240	62.97		1.4749	2	0	2	5		43
31.96	31.96	2.798	0	2	1	35	36	93	63.00		1.4742	0	6	1	2		15
35.47	35.48	2.529	2	2	0	11	10	35	63.05		1.4732	2	5	1	0		3
36.60	36.60	2.453	0	4	0	10	8	33	63.53	63.52	1.4633	1	3	2	14	11	120
39.76	39.76	2.265	1	4	0	4	4	17	63.74	63.70	1.4589	4	1	0	1	7	6
40.41	40.42	2.230	2	0	1	11	9	41	63.76		1.4585	2	1	2	1		5
41.18	41.18	2.190	1	3	1	6	5	23	65.17	65.18	1.4303	2	6	0	5	4	48
41.49	41.50	2.175	2	1	1	9	8	37	66.08	66.08	1.4128	4	2	0	5	6	46
44.60	44.60	2.030	2	2	1	42	34	191	66.10		1.4124	2	2	2	4		34
45.54	45.54	1.9904	0	4	1	12	10	58	66.81	66.82	1.3991	3	4	1	1	3	7
47.08	47.08	1.9287	3	1	0	7	6	37	66.83		1.3989	0	4	2	3		27
48.21	48.20	1.8863	2	4	0	8	7	41	67.35	67.34	1.3893	3	5	0	2	2	22
48.21		1.8860	1	4	1	1		7	68.78	68.78	1.3637	1	7	0	3	2	28
48.87	48.88	1.8621	1	5	0	4	4	24	68.93	68.96	1.3611	1	4	2	1	2	9
49.43	49.42	1.8425	2	3	1	0	0	2	69.36	69.36	1.3537	4	0	1	3	2	28
49.91	49.92	1.8258	3	2	0	2	2	12	69.89	69.90	1.3448	4	3	0	0	0	1
53.79	53.80	1.7029	0	0	2	10	8	64	70.12	70.12	1.3410	4	1	1	1	1	7
54.38	54.38	1.6857	3	3	0	8	7	51	71.48	71.48	1.3187	2	6	1	3	2	27
54.64	54.64	1.6783	3	1	1	14	12	89	72.35	72.36	1.3050	4	2	1	4	3	41
55.66	55.66	1.6501	2	4	1	14	11	92	73.57	73.58	1.2864	3	5	1	4	3	47
56.20	56.26	1.6353	0	6	0	6	22	42	74.23	74.24	1.2765	3	1	2	4	3	40
56.25		1.6340	2	5	0	0		1	74.95	74.96	1.2661	2	7	0	0	4	3
56.26		1.6338	1	5	1	24		161	74.95		1.2660	1	7	1	4		42

Table A.17. (continued)

2θ	Peak	d	h	k	l	I(INT)	(PK)	(DS)
75.08	75.08	1.2643	4	4	0	2	5	26
75.09		1.2640	2	4	2	4		42
75.55	75.60	1.2575	3	6	0	0	2	3
75.61		1.2567	1	5	2	2		23
76.02	75.82	1.2508	4	3	1	0	1	1
76.42	76.42	1.2453	3	2	2	1	1	9
77.81	77.82	1.2265	0	8	0	0	0	2
80.03	80.04	1.1980	3	3	2	4	3	53
80.95	81.08	1.1867	2	7	1	1	2	11
81.07		1.1852	4	4	1	3		39
81.53	81.54	1.1797	3	6	1	0	3	4
81.55		1.1795	0	6	2	3		45
81.57		1.1792	4	5	0	0		2
82.20	82.20	1.1718	5	1	0	2	2	31
83.76	83.76	1.1539	0	8	1	3	2	44
84.88	84.88	1.1415	3	7	0	2	1	24
85.02	85.02	1.1400	3	4	2	1	1	8
85.46	85.46	1.1353	0	0	3	0	0	3
85.71	85.72	1.1325	2	8	0	1	1	14
87.39	87.40	1.1150	4	0	2	1	1	13
87.46		1.1143	4	5	1	0		4
87.87	87.88	1.1102	5	3	0	1	1	10
88.08	88.12	1.1080	5	1	1	2	4	24
88.10		1.1079	4	1	2	0		7
88.12		1.1077	1	1	3	4		56
88.29	88.30	1.1060	0	2	3	2	3	28
89.37	89.38	1.0954	4	6	0	1	3	12
89.39		1.0952	2	6	2	4		62

Table A.18. Simulated X-ray powder pattern for $\text{Ca}_{1.7}\text{Sr}_{0.3}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.57	17.58	5.044	1	1	0	100	100	100	57.14	57.14	1.6108	1	1	2	8	7	56
18.10	18.10	4.898	0	2	0	26	27	27	57.33	57.30	1.6058	0	2	2	3	6	18
23.62	23.62	3.764	1	2	0	2	2	3	57.35		1.6052	3	2	1	2		11
26.19	26.20	3.400	0	0	1	5	5	10	59.63	59.64	1.5492	1	2	2	0	0	2
30.35	30.36	2.942	2	0	0	20	19	49	60.42	60.42	1.5310	3	4	0	1	1	6
31.31	31.32	2.855	1	3	0	59	54	150	61.47	61.48	1.5072	3	3	1	9	7	75
31.71	31.72	2.819	1	1	1	89	83	232	63.11	63.12	1.4719	2	0	2	5	6	42
31.73		2.818	2	1	0	2		5	63.13		1.4716	0	6	1	2		15
32.02	32.02	2.793	0	2	1	34	34	88	63.14		1.4712	4	0	0	1		10
35.56	35.56	2.522	2	2	0	11	9	35	63.19		1.4703	2	5	1	0		3
36.67	36.68	2.449	0	4	0	10	8	33	63.66	63.66	1.4605	1	3	2	13	10	114
39.84	39.84	2.261	1	4	0	4	4	16	63.91	63.84	1.4555	2	1	2	1	6	5
40.51	40.52	2.225	2	0	1	11	9	41	63.94		1.4549	4	1	0	1		5
41.26	41.26	2.186	1	3	1	6	5	25	65.31	65.32	1.4275	2	6	0	5	4	46
41.59	41.60	2.170	2	1	1	8	7	34	66.25	66.26	1.4096	2	2	2	4	6	34
44.70	44.70	2.026	2	2	1	40	32	185	66.28		1.4090	4	2	0	5		45
45.62	45.62	1.9870	0	4	1	12	10	57	66.96	66.96	1.3964	0	4	2	3	3	26
47.22	47.22	1.9234	3	1	0	7	6	37	66.98		1.3960	3	4	1	1		6
48.31	48.32	1.8826	1	4	1	1	7	6	67.52	67.52	1.3862	3	5	0	2	2	21
48.32		1.8822	2	4	0	8		40	68.92	68.92	1.3613	1	7	0	3	2	27
48.97	48.96	1.8587	1	5	0	5	4	24	69.08	69.10	1.3586	1	4	2	1	2	8
49.54	49.54	1.8386	2	3	1	0	0	1	69.57	69.58	1.3502	4	0	1	3	2	27
50.05	50.06	1.8210	3	2	0	2	2	11	70.33	70.32	1.3376	4	1	1	1	1	6
53.89	53.90	1.6998	0	0	2	10	8	61	71.64	71.64	1.3162	2	6	1	3	2	27
54.53	54.54	1.6815	3	3	0	8	7	50	72.57	72.56	1.3017	4	2	1	4	3	41
54.79	54.80	1.6741	3	1	1	13	11	87	73.76	73.76	1.2836	3	5	1	4	3	46
55.78	55.78	1.6467	2	4	1	13	11	89	74.42	74.42	1.2737	3	1	2	4	3	39
56.31	56.36	1.6325	0	6	0	6	20	40	75.11	75.12	1.2638	1	7	1	4	3	42
56.37		1.6309	1	5	1	23		154	75.12		1.2637	2	7	0	0		3
56.38		1.6307	2	5	0	0		1	75.27	75.28	1.2615	2	4	2	4	5	41

Table A.18. (continued)

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
75.30		1.2611	4	4	0	2		26
75.74	75.76	1.2548	3	6	0	0	2	3
75.77		1.2544	1	5	2	2		24
76.62	76.62	1.2426	3	2	2	1	1	8
77.97	77.98	1.2244	0	8	0	0	0	2
80.24	80.24	1.1954	3	3	2	4	3	52
81.13	81.14	1.1845	2	7	1	1	1	10
81.31	81.30	1.1824	4	4	1	3	2	38
81.72	81.72	1.1774	0	6	2	3	3	43
81.74		1.1772	3	6	1	0		3
81.81		1.1764	4	5	0	0		2
82.47	82.48	1.1686	5	1	0	2	2	30
83.93	83.94	1.1520	0	8	1	3	2	42
85.09	85.10	1.1392	3	7	0	2	1	23
85.24	85.24	1.1376	3	4	2	1	1	7
85.65	85.64	1.1332	0	0	3	0	0	3
85.91	85.92	1.1304	2	8	0	1	1	14
87.65	87.66	1.1124	4	0	2	1	1	13
87.72		1.1117	4	5	1	0		3
88.17	88.34	1.1072	5	3	0	1	4	10
88.33		1.1056	1	1	3	4		54
88.36		1.1053	4	1	2	0		6
88.38		1.1051	5	1	1	2		24
88.49		1.1040	0	2	3	2		27
89.60	89.60	1.0932	2	6	2	4	3	59
89.63		1.0929	4	6	0	1		12

Table A.19. Simulated X-ray powder pattern for $\text{Ca}_{1.8}\text{Sr}_{0.2}\text{PbO}_4$

2θ	Peak .	d	h	k	ℓ	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	ℓ	I(INT)	I(PK)	I(DS)
17.61	17.62	5.032	1	1	0	100	100	100	57.44	57.42	1.6029	0	2	2	3	6	18
18.13	18.14	4.889	0	2	0	26	28	28	57.51		1.6013	3	2	1	1		10
23.67	23.68	3.756	1	2	0	2	2	3	59.76	59.76	1.5463	1	2	2	0	0	2
26.24	26.24	3.393	0	0	1	6	5	11	60.57	60.58	1.5274	3	4	0	1	1	6
30.44	30.44	2.934	2	0	0	20	18	47	61.63	61.64	1.5037	3	3	1	9	7	73
31.37	31.38	2.849	1	3	0	56	51	143	63.25	63.26	1.4691	0	6	1	2	6	16
31.78	31.78	2.813	1	1	1	87	79	224	63.26		1.4688	2	0	2	5		40
31.81		2.810	2	1	0	2		4	63.33		1.4673	2	5	1	0		3
32.08	32.08	2.788	0	2	1	32	33	84	63.34		1.4672	4	0	0	1		10
35.66	35.66	2.516	2	2	0	11	10	35	63.79	63.80	1.4578	1	3	2	13	10	108
36.73	36.74	2.445	0	4	0	10	8	32	64.05	63.96	1.4525	2	1	2	0	6	4
39.92	39.92	2.257	1	4	0	4	3	15	64.13		1.4509	4	1	0	1		5
40.61	40.62	2.220	2	0	1	11	9	42	65.46	65.46	1.4247	2	6	0	5	4	44
41.34	41.34	2.182	1	3	1	7	6	27	66.40	66.48	1.4067	2	2	2	4	5	34
41.69	41.70	2.165	2	1	1	8	7	31	66.48		1.4052	4	2	0	5		43
44.81	44.82	2.021	2	2	1	39	31	178	67.10	67.10	1.3939	0	4	2	3	2	26
45.70	45.70	1.9835	0	4	1	12	9	55	67.15		1.3928	3	4	1	1		5
47.35	47.36	1.9182	3	1	0	7	6	36	67.69	67.70	1.3831	3	5	0	2	2	21
48.40	48.42	1.8791	1	4	1	1	7	5	69.06	69.06	1.3589	1	7	0	3	2	27
48.43		1.8782	2	4	0	7		39	69.22	69.24	1.3561	1	4	2	1	2	7
49.06	49.06	1.8554	1	5	0	5	4	25	69.78	69.78	1.3467	4	0	1	3	2	26
49.65	49.66	1.8346	2	3	1	0	0	1	70.54	70.54	1.3341	4	1	1	1	0	5
50.19	50.20	1.8162	3	2	0	2	1	10	71.80	71.80	1.3136	2	6	1	3	2	28
54.00	54.00	1.6967	0	0	2	9	7	59	72.78	72.78	1.2983	4	2	1	4	3	40
54.68	54.68	1.6773	3	3	0	7	7	48	73.95	73.94	1.2808	3	5	1	4	3	45
54.94	54.94	1.6699	3	1	1	13	11	85	74.62	74.62	1.2709	3	1	2	3	3	38
55.91	55.90	1.6433	2	4	1	13	10	87	75.27	75.28	1.2615	1	7	1	4	3	41
56.41	56.48	1.6297	0	6	0	6	19	75.28		1.2613	2	7	0	0		2	
56.48		1.6279	1	5	1	22		148	75.44	75.48	1.2590	2	4	2	4	5	40
57.25	57.26	1.6078	1	1	2	8	7	56	75.52		1.2580	4	4	0	2		25

Table A.19. (continued)

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
75.93	75.94	1.2521	3	6	0	0	2	3
75.93		1.2521	1	5	2	2		25
76.82	76.82	1.2398	3	2	2	1	1	8
78.13	78.14	1.2223	0	8	0	0	0	2
80.45	80.44	1.1928	3	3	2	4	3	50
81.32	81.32	1.1823	2	7	1	1	1	9
81.54	81.54	1.1795	4	4	1	3	2	38
81.90	81.90	1.1754	0	6	2	3	3	41
81.95		1.1747	3	6	1	0		3
82.04		1.1736	4	5	0	0		2
82.75	82.76	1.1654	5	1	0	2	2	29
84.11	84.12	1.1500	0	8	1	3	2	39
85.31	85.32	1.1368	3	7	0	2	1	23
85.46	85.46	1.1352	3	4	2	0	1	6
85.84	85.84	1.1311	0	0	3	0	0	3
86.11	86.10	1.1283	2	8	0	1	1	14
87.91	87.92	1.1098	4	0	2	1	1	13
87.97		1.1091	4	5	1	0		3
88.46	88.54	1.1043	5	3	0	1	3	11
88.53		1.1036	1	1	3	4		52
88.62	88.68	1.1027	4	1	2	0	3	6
88.68		1.1022	5	1	1	2		24
88.69		1.1020	0	2	3	2		26
89.82	89.82	1.0911	2	6	2	4	3	57
89.89		1.0904	4	6	0	1		12

Table A.20. Simulated X-ray powder pattern for $\text{Ca}_{1.9}\text{Sr}_{0.1}\text{PbO}_4$

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.66	17.66	5.019	1	1	0	100	100	100	57.56	57.54	1.6000	0	2	2	3	6	19
18.16	18.18	4.881	0	2	0	27	28	28	57.66		1.5974	3	2	1	1		9
23.72	23.72	3.748	1	2	0	2	2	3	59.88	59.88	1.5434	1	2	2	0	0	1
26.29	26.30	3.387	0	0	1	6	6	12	60.73	60.74	1.5238	3	4	0	1	1	5
30.53	30.54	2.926	2	0	0	19	17	45	61.79	61.80	1.5001	3	3	1	9	7	72
31.43	31.44	2.844	1	3	0	54	49	136	63.37	63.40	1.4665	0	6	1	2	5	16
31.85	31.86	2.808	1	1	1	84	76	216	63.41		1.4658	2	0	2	5		38
31.90		2.803	2	1	0	1		3	63.47		1.4644	2	5	1	0		2
32.14	32.14	2.783	0	2	1	31	32	81	63.54	63.56	1.4631	4	0	0	1	4	10
35.75	35.76	2.510	2	2	0	11	10	35	63.93	63.92	1.4551	1	3	2	12	9	103
36.80	36.80	2.440	0	4	0	10	8	32	64.20	64.10	1.4495	2	1	2	0	6	3
40.00	40.00	2.252	1	4	0	4	3	14	64.33		1.4469	4	1	0	0		4
40.71	40.72	2.214	2	0	1	11	9	42	65.60	65.60	1.4219	2	6	0	5	4	43
41.42	41.42	2.178	1	3	1	7	6	28	66.56	66.56	1.4039	2	2	2	4	4	34
41.80	41.80	2.159	2	1	1	7	6	29	66.68	66.68	1.4015	4	2	0	5	5	42
44.92	44.92	2.016	2	2	1	37	31	172	67.23	67.24	1.3914	0	4	2	3	2	26
45.79	45.80	1.9800	0	4	1	11	9	54	67.33		1.3896	3	4	1	0		4
47.49	47.50	1.9129	3	1	0	7	6	35	67.86	67.86	1.3800	3	5	0	2	2	21
48.50	48.54	1.8756	1	4	1	1	7	5	69.20	69.20	1.3565	1	7	0	3	2	26
48.54		1.8742	2	4	0	7		39	69.37	69.38	1.3536	1	4	2	1	2	7
49.16	49.16	1.8520	1	5	0	5	4	26	69.99	70.00	1.3431	4	0	1	3	2	25
49.77	49.76	1.8306	2	3	1	0	0	1	70.75	70.74	1.3306	4	1	1	0	0	5
50.33	50.34	1.8114	3	2	0	2	1	9	71.96	71.96	1.3111	2	6	1	3	2	28
54.11	54.10	1.6936	0	0	2	9	7	56	73.00	73.00	1.2950	4	2	1	4	3	40
54.83	54.82	1.6731	3	3	0	7	6	47	74.13	74.14	1.2780	3	5	1	4	3	43
55.09	55.10	1.6657	3	1	1	13	11	83	74.81	74.82	1.2680	3	1	2	3	3	38
56.03	56.04	1.6399	2	4	1	13	10	85	75.42	75.42	1.2593	1	7	1	4	3	40
56.52	56.60	1.6269	0	6	0	5	18	75.45		1.2589	2	7	0	0		2	
56.59		1.6250	1	5	1	21		141	75.62	75.62	1.2566	2	4	2	4	4	40
57.37	57.38	1.6047	1	1	2	8	7	56	75.74		1.2548	4	4	0	2		24

Table A.20. (continued)

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
76.10	76.10	1.2498	1	5	2	2	2	25
76.12		1.2494	3	6	0	0		2
77.02	77.02	1.2371	3	2	2	1	0	7
78.29	78.30	1.2202	0	8	0	0	0	2
80.66	80.66	1.1903	3	3	2	4	3	49
81.50	81.50	1.1800	2	7	1	1	1	8
81.78	81.78	1.1767	4	4	1	3	2	37
82.07	82.06	1.1733	0	6	2	3	3	39
82.16		1.1722	3	6	1	0		3
82.28	82.32	1.1708	4	5	0	0	1	2
83.03	83.04	1.1621	5	1	0	2	2	28
84.29	84.28	1.1480	0	8	1	3	2	37
85.53	85.54	1.1345	3	7	0	2	1	22
85.69	85.70	1.1328	3	4	2	0	1	6
86.04	85.96	1.1291	0	0	3	0	0	3
86.31	86.30	1.1262	2	8	0	1	1	14
88.17	88.18	1.1072	4	0	2	1	1	13
88.23		1.1066	4	5	1	0		3
88.74	88.74	1.1015	1	1	3	3	3	50
88.76		1.1014	5	3	0	1		11
88.89	88.98	1.1001	4	1	2	0	3	5
88.90		1.1000	0	2	3	2		25
88.98		1.0992	5	1	1	2		24

Table A.21. Simulated X-ray powder pattern for Ca₂SrPbO₄

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)	2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
17.70	17.72	5.007	1	1	0	100	100	100	57.67	57.66	1.5971	0	2	2	3	6	19
18.19	18.20	4.872	0	2	0	28	30	29	57.82	57.82	1.5934	3	2	1	1	3	8
23.77	23.78	3.740	1	2	0	2	1	2	60.01	60.00	1.5405	1	2	2	0	0	1
26.34	26.34	3.381	0	0	1	7	6	13	60.89	60.90	1.5202	3	4	0	1	0	4
30.61	30.62	2.918	2	0	0	18	16	43	61.96	61.96	1.4965	3	3	1	9	7	71
31.49	31.50	2.838	1	3	0	51	48	130	63.49	63.54	1.4640	0	6	1	2	5	17
31.91	31.92	2.802	1	1	1	81	75	209	63.55		1.4628	2	0	2	4		36
31.99		2.795	2	1	0	1		3	63.61		1.4615	2	5	1	0		2
32.20	32.20	2.778	0	2	1	29	31	77	63.74	63.72	1.4590	4	0	0	1	4	10
35.84	35.84	2.503	2	2	0	11	10	35	64.06	64.06	1.4524	1	3	2	12	9	98
36.86	36.86	2.436	0	4	0	10	8	31	64.35	64.24	1.4466	2	1	2	0	5	3
40.07	40.08	2.248	1	4	0	3	3	13	64.53	64.52	1.4429	4	1	0	0	1	4
40.82	40.82	2.209	2	0	1	11	9	43	65.75	65.74	1.4191	2	6	0	5	3	41
41.51	41.52	2.174	1	3	1	7	6	30	66.71	66.72	1.4010	2	2	2	4	3	34
41.90	41.90	2.154	2	1	1	6	6	26	66.89	66.90	1.3977	4	2	0	4	5	40
45.02	45.02	2.012	2	2	1	36	30	167	67.37	67.36	1.3889	0	4	2	3	2	25
45.87	45.88	1.9766	0	4	1	11	9	52	67.50	67.54	1.3865	3	4	1	0	1	4
47.63	47.64	1.9077	3	1	0	7	6	35	68.04	68.04	1.3769	3	5	0	2	2	20
48.59	48.64	1.8721	1	4	1	1	6	4	69.34	69.34	1.3541	1	7	0	3	2	25
48.65		1.8701	2	4	0	7		38	69.52	69.52	1.3511	1	4	2	1	2	6
49.25	49.26	1.8486	1	5	0	5	4	26	70.20	70.20	1.3396	4	0	1	2	2	24
49.88	49.88	1.8267	2	3	1	0	0	1	70.96	70.96	1.3271	4	1	1	0	0	4
50.47	50.48	1.8067	3	2	0	1	1	8	72.12	72.12	1.3085	2	6	1	3	2	28
54.22	54.22	1.6905	0	0	2	8	7	53	73.22	73.22	1.2917	4	2	1	4	3	39
54.97	54.98	1.6689	3	3	0	7	6	46	74.32	74.32	1.2752	3	5	1	4	3	42
55.24	55.24	1.6615	3	1	1	12	11	81	75.01	75.02	1.2652	3	1	2	3	2	37
56.16	56.16	1.6365	2	4	1	12	10	83	75.58	75.58	1.2571	1	7	1	4	3	40
56.62	56.70	1.6242	0	6	0	5	18	35	75.62		1.2565	2	7	0	0		2
56.71		1.6220	1	5	1	20		135	75.79	75.80	1.2541	2	4	2	3	4	39
57.49	57.50	1.6017	1	1	2	8	7	56	75.96	75.98	1.2517	4	4	0	2	3	24

Table A.21. (continued)

2θ	Peak	d	h	k	l	I(INT)	I(PK)	I(DS)
76.26	76.26	1.2475	1	5	2	2	2	26
76.32		1.2468	3	6	0	0		2
77.22	77.22	1.2344	3	2	2	1	0	6
78.45	78.46	1.2181	0	8	0	0	0	2
80.87	80.88	1.1877	3	3	2	4	3	48
81.69	81.70	1.1778	2	7	1	1	1	7
82.02	82.02	1.1738	4	4	1	3	2	36
82.25	82.26	1.1712	0	6	2	3	3	37
82.37		1.1698	3	6	1	0		2
82.52	82.50	1.1680	4	5	0	0	1	2
83.31	83.32	1.1589	5	1	0	2	1	27
84.47	84.46	1.1460	0	8	1	3	2	36
85.75	85.76	1.1321	3	7	0	2	1	22
85.92	86.02	1.1304	3	4	2	0	1	5
86.23	86.20	1.1270	0	0	3	0	0	3
86.51	86.52	1.1241	2	8	0	1	1	14
88.44	88.44	1.1045	4	0	2	1	1	13
88.49		1.1040	4	5	1	0		2
88.95	88.96	1.0995	1	1	3	3	3	49
89.06	89.10	1.0984	5	3	0	1	2	11
89.10		1.0980	0	2	3	2		24
89.15		1.0975	4	1	2	0		4
89.28	89.26	1.0963	5	1	1	2	3	24

INTERNAL DISTRIBUTION

1-2.	Central Research Library	21.	F. M. Foust
3.	Document Reference Section	22-26.	B. J. Reardon
4-5.	Laboratory Records Department	27.	V. K. Sikka
6.	Laboratory Records, ORNL-RC	28.	E. D. Specht
7.	ORNL Patent Section	29.	V. J. Tennery
8-10.	M&C Records Office	30.	Y. A. Chang (Consultant)
11.	O. B. Cavin	31.	H. W. Foglesong (Consultant)
12.	R. S. Carlsmith	32.	J. J. Hren (Consultant)
13.	D. F. Craig	33.	M. L. Savitz (Consultant)
14.	R. A. Hawsey	34.	J. G. Simon (Consultant)
15-19.	C. R. Hubbard	35.	K. E. Spear (Consultant)
20.	G. M. Ludtka		

EXTERNAL DISTRIBUTION

36. ALFRED UNIVERSITY, Binns-Merrill Hall, Alfred, NY 14802.

R. L. Snyder

37-38. ARGONNE NATIONAL LABORATORY, 9700 S. Cass Avenue,
Argonne, IL 60439

S. Lake, TTC/900
R. Poeppel, Bldg 212

39. BROOKHAVEN NATIONAL LABORATORY, Department of Applied
Science, MTLS Science Division, Building 480, Upton, Long Island,
NY 11973

D. O. Welch

40. CORNING INCORPORATED, Research, Development & Engineering,
Instrumental Analysis Department, SP FR OI 8, Corning, NY 14831

H. J. Holland

41. EASTMAN KODAK COMPANY, Kodak Park, Building 49, Rochester,
NY 14652-3712

T. N. Blanton

42. ENERGETICS, INC., Project Manager, 7164 Columbia Gateway Drive,
Columbia, MD 21046

J. Badin

- 43-45. LOS ALAMOS NATIONAL LABORATORY, P.O. Box 1663, Los Alamos,
NM 87545
- K. Adams, MS K763
L. S. Blair, Industrial Program Manager, ERDC/5PC, MS K763
E. Peterson, MS K763
46. MONASH UNIVERSITY, Department of Physics, Clayton 3168, Australia
- R. A. Coyle
- 47-49. NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, Materials
Science & Engineering Laboratory, Gaithersburg, MD 20899
- L. P. Cook
R. S. Roth
W. Wong-Ng
50. NATIONAL RENEWABLE ENERGY LABORATORY, 1617 Cole Blvd.,
Golden, CO 80401
- R. D. Blaugher
51. NAVAL WEAPONS CENTER, Code 3851, China Lake, CA 93555
- C. Lowe-Ma
52. SANDIA NATIONAL LABORATORIES, Division 6221, P.O. Box 5800,
Albuquerque, NM 87185
- T. C. Bickel
53. U.S. DOE, ADVANCED UTILITY CONCEPTS DIVISION, Director,
Forrestal RM 5F064, MS CE142, 1000 Independence Avenue, S.W.,
Washington, DC 20585
- R. Eaton
- 54-55. U.S. DOE, CONSERVATION AND RENEWABLE ENERGY, Forrestal
Building, 1000 Independence Avenue, S.W., Washington, DC 20585
- A. A. Chesnes, Deputy Assistant Secretary, CE-30
J. J. Eberhardt, CE-34
56. U.S. DOE, SUPERCONDUCTIVITY SYSTEMS OFFICE OF ENERGY
MANAGEMENT, Program Manager, Forrestal Building, 1000 Independence
Avenue, S.W., Washington, DC 20585
- J. G. Daley, RM 5F064, CE-142

57-60. U.S. DOE, OAK RIDGE FIELD OFFICE, P.O. Box 2001, Oak Ridge,
TN 37831

Assistant Manager for Energy Research and Development
G. C. Manthey
G. L. Riner
M. J. Rohr

61-70. U.S. DOE, OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION,
P.O. Box 62, Oak Ridge, TN 37831

For distribution by microfiche as shown in DOE/OSTI-4500, Distribution
Category UC-364 (Superconducting Materials)

