Weissenberg photographs were taken about a and c axes with filtered copper radiation; from these the systematic absences were determined (h0l absent when l is odd, 0k0 absent when k is odd).

The cell dimensions were determined from the Weissenberg films with the SRC microdensitometer service; the errors were calculated from the standard deviations of the individual values.

The results of these observations are

\[ a = 7.587 \pm 0.042 \text{ Å} \]
\[ b = 20.362 \pm 0.053 \text{ Å} \]
\[ c = 12.033 \pm 0.046 \text{ Å} \]
\[ \beta = 120.68 \pm 0.29^\circ \]

Space group \( P2_1/c \).

The calculated density is in agreement with those observed and reported: 1.401 Mg m\(^{-3}\) (Mez, 1968) and 1.416 (Chapman & Whitaker, 1972). The cell dimensions are in reasonable agreement with those reported previously (Chapman & Whitaker, 1972). The unit cell chosen by Mez (1968) is different but equivalent to that given above. In the present investigation the cell chosen is that which conforms to the morphology of the grown crystals.

**Powder data**

The X-ray pattern was obtained with an 114.6 mm diameter Debye–Scherrer camera and filtered cobalt radiation (Co K\(_{\alpha m}\), \( \lambda = 1.79020 \) Å) and the films were photometered. The observed and calculated spacings and relative intensities are listed in Table 1; the problems of multiple indexing were reduced by reference to the single-crystal intensities. The patterns of the recrystallized and as-received compound are in agreement with each other. The pattern is in good agreement with that reported previously (Chapman & Whitaker, 1971); the differences can be attributed to using a specimen of better crystallinity in the present case.

**References**


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**Crystal data for SrRE\(_2\)O\(_4\) (RE = rare earth + Y, In). By John G. Pepin, Materials Research Laboratory, The Pennsylvania State University, University Park, Pennsylvania 16802, USA**

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**Abstract**

Orthorhombic unit-cell constants for SrRE\(_2\)O\(_4\) (RE = Sm, Eu, Gd, Dy, Ho, Er, Tm, Yb, Lu, In and Y) have been determined by refinement of X-ray powder diffraction data. Unit-cell volumes are plotted against the cube of the trivalent rare-earth ionic radius.

**Origin of specimens**

Nitrate solutions of correct metal ratios were prepared by dissolving weighed amounts (1 to 2 g) of the appropriate rare-earth oxide (Research Chemicals, 99.9\%\(_{\text{w}}\)) in 30 ml of nitric acid and adding a calculated amount of standardized strontium nitrate (Fisher Scientific, 99.9\%\(_{\text{w}}\)) solution. The solutions were
dried and then calcined at 870 K to remove the nitrous oxides. The residue of mixed oxides was ground thoroughly, pressed into pellets, and fired in air at 1570 K on platinum foil. The pellets were held at this temperature for 48 h, cooled rapidly to room temperature, ground thoroughly, re-pelletized and refired for a final 48 h. After final cooling all samples were checked and confirmed as phase pure by X-ray diffraction.

**Powder data**

X-ray powder diffraction patterns were obtained at 298 \( \pm 2 \) K with a standard diffractometer and a diffracted beam monochromator and Cu K\( \alpha \) radiation \((\lambda_2 = 1.54178, \lambda_2 = 1.54051 \, \text{Å})\). Peaks were corrected relative to a silicon internal standard (US National Bureau of Standards, Standard Reference Material Number 640, \( a_0 = 5.43088 \, \text{Å} \)). Complete powder data for SrSm\(_2\)O\(_4\), SrDy\(_2\)O\(_4\), SrLu\(_2\)O\(_4\), SrIn\(_2\)O\(_4\), SrYb\(_2\)O\(_4\), SrTb\(_2\)O\(_4\), and SrY\(_2\)O\(_4\) have been submitted to the Powder Diffraction File.

**Crystal geometry**

Observed \( d \) spacings were indexed on the basis of a primitive orthorhombic unit cell using a computer technique (Visser, 1969) and cell constants refined using a least-squares program (Appleman, Handwerker & Evans, 1963). Cell constants are presented in Table 1.

**Comparison of structures**

SrTb\(_2\)O\(_4\) (Paletta & Müller-Buschbaum, 1968), SrYb\(_2\)O\(_4\) (Müller-Buschbaum & von Schenck, 1970) and SrY\(_2\)O\(_4\) (Müller-Buschbaum, 1968) are isostructural with CaFe\(_2\)O\(_4\) (Hill, Peiser & Rait, 1956) with space group \( Pnma \left( \overline{D}^{19}_h \right) \). No. 62. The powder patterns of all the compounds investigated were indexed with similar unit cells. A plot of unit-cell volume against the cube of the sixfold coordinated trivalent rare-earth effective ionic radius (Shannon, 1976) shows a curvilinear relationship. The data of Carter & Feigelson (1964) for SrSc\(_2\)O\(_4\) and Paletta & Müller-Buschbaum (1968) for SrTb\(_2\)O\(_4\) are included in the plot (Fig. 1).

**Comparison with other results**

Compounds in this series have been prepared by Lopato (1976), Glasser, Dent-Glasser & Schieber (1965), Schwarz & Bommert (1964) and Queyroux (1969). SrEr\(_2\)O\(_4\) has been prepared by Bärnighausen & Brauer (1962). SrIn\(_2\)O\(_4\) has been prepared by Cruickshank, Taylor & Glasser (1964) and Schwarz & Bommert (1964). Barry & Roy (1967) report unindexed powder patterns for SrGd\(_2\)O\(_4\), SrHo\(_2\)O\(_4\), and SrYb\(_2\)O\(_4\). Carter & Feigelson (1964) prepared SrSc\(_2\)O\(_4\) and supplied a complete powder pattern. Structure determinations have been done on SrYb\(_2\)O\(_4\) (Müller-Buschbaum & von Schenck, 1970), SrTb\(_2\)O\(_4\) (Paletta & Müller-Buschbaum, 1968) and SrY\(_2\)O\(_4\) (Müller-Buschbaum, 1968). Lopato (1976) has studied the systems SrO–Sm\(_2\)O\(_3\) and SrO–Dy\(_2\)O\(_3\) at temperatures greater than 1570 K and has established the stability of SrSm\(_2\)O\(_4\) and SrDy\(_2\)O\(_4\) from 1570 to above 2270 K. Cell constants determined in this study were in good agreement with those reported by other authors, with the best agreement with the results of Schwarz & Bommert (1964).

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**References**


