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Thermal expansion coefficients of α-monoclinic selenium.

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Selenium crystals with particle size ranging from that of a fine powder to specimens approximately 1 mm. in their greatest dimension were obtained from a saturated solution of carbon disulfide. The samples examined showed no characteristics either to optical or X-ray examination to differentiate them into more than one class, Se_α.

The camera used was an adaptation of Buerger's (1937) precision back-reflection Weissenberg camera, diameter 7·993 cm., $K = 2°$ per mm., oscillation amplitude about 50°. The temperature was controlled by means of an electrically powered furnace designed by the author as a modification of the Buerger (1943) high-temperature powder camera. The single selenium crystal was mounted on the end of a short glass capillary and aligned on a goniometer head by means of Laue, rotation and Weissenberg photographs. It was then coated with fine filings of very pure aluminum, and the two desired Weissenberg patterns, one at tap-water temperature and the other at approximately 1 W. power input ($\Delta t \doteqdot 55°$ C.) were taken together on the same film.

The patterns were measured on a Cenco 10 cm. comparator. The aluminum powder lines, with the aid of the data of Nix & MacNair (1941), served, with known data on the aluminum thermal expansion and the measured tap-water temperature, to calibrate the film as to angle per millimeter and to give the value of the elevated temperature. Radiation used was unfiltered Cr for the 0.0.10 order and Co for all other cases. Exposure time was usually 5 hr. for each temperature run.

The breadth of the Se lines was less than 8′, the aluminum about 5′. Precision in the spacing values was about one part in ten thousand. The results are summarized in Tables 1 and 2.

Table 1. *Observations at particular temperatures*

Unit	t_1 (° C.)		t_2 (° C.)		Order indices
$a_0 \sin\beta$	20·0	9·0440 kX.	77·3	9·0427 kX.	860 and 680
b_0	20·0	9·0545	77·3	9·1003	860 and 680
	20·5	9·0546	75·2	9·0954	0.10.0
$c_0 \sin\beta$	21·0	11·573	80·2	11·615	0.0.10
β	24·2	90·882°	79·9	90·904°	709
	24·2	90·831	79·9	90·876	5.0.11

Table 2. *Summary at* 20° C.

Unit	Coefficient of expansion (per ° C.)	Author's values	Burbank's (1951) values	Klug's (1934) values
a_0	$-1{\cdot}5\times10^{-6}$	9·046 kX.	9·05 kX.	8·992 kX.
b_0	$+84{\cdot}7\times10^{-6}$	9·054	9·07	8·973
c_0	$+63{\cdot}3\times10^{-6}$	11·573	11·61	11·52
β	$+5{\cdot}5\times10^{-6}$	90° 52′	90° 46′	91° 34′
V	$+145\times10^{-6}$	947·7 kX.³		

Author's values of a_0, b_0 and c_0 are ±0·001 kX. units; β is about ±3′.

In addition to the planes actually used to obtain the above, corroborative readings were made on the following neighboring planes, hot and cold: 1.10.0; 10.1.0 (not resolved since $\Delta\theta = 3'$ only); and 0.1.10.

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Spherical Patterson sections.

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Introduction

The lengths of certain interatomic, and particularly intra-ionic, vectors in an inorganic structure can often be predicted quite accurately from tables of atomic radii. In three-dimensional Patterson space peaks due to intra-ionic vectors can be identified at once if there is only one kind of complex ion; in a sulphate all the S–O peaks will be found on a sphere of radius 1·6 A. round the origin.