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Thallous Chloride Diffraction Standard Instructions

Catalog Number: 40825

The nominal value of the effective camera length of an EM operating in the selected area mode is not sufficiently accurate for calculations of lattice spacing. The actual value of camera length must be calibrated at the same accelerating voltage and objective lens setting by reference to a known substance with well-defined diffraction spacings. Normal specimens are evaporated films of aluminum or thallous chloride. Very small crystalline size yields ring patterns suitable for calibration.

To properly use an electron diffraction standard, several conditions are necessary:

1. After obtaining the pattern of an unknown, it is necessary to expose the known standard to the same electrical magnetic conditions, specifically the same lens current or high voltage.
2. The specimen must be in the same position as the unknown had been. Small movements of the stage are permissible to obtain a clearer pattern of the standard.

After developing the diffraction plates, the standard is measured first. The indices are assigned per the attached ASTM “d” spacings. After assigning the spacings, calculate “K” using the formula K = Sd; where “K” is a constant that represents wavelength of the beam, camera length and associated variable crystallographic data, “S” is the diameter of the ring in centimeters, and “d” is the interplanar spacings in angstroms. The value for “K” for the first five lines should be within 1% of each other. Use the mean value of “K”.

Next, the pattern of the unknown is measured, and using “K”, determined from the standard, the “d” spacings of the unknown are calculated. It is then necessary to establish the identity of the unknown from the ASTM published data.

Thallous Chloride Diffraction Pattern

Thallium Chloride (Cubic): ASTM "d" Spacings

Miller Indices hkl	Lattice Spacings d in Å	Identity I	Lattice Constant a in Å
100	3.8400	60	3.8400
110	2.7170	100	3.8420
111	2.2180	22	3.8420
200	1.9210	18	3.8420
210	1.7180	25	3.8410
211	1.5680	35	3.8410
220	1.3580	9	3.8410
300	1.2810	9	3.8430
310	1.2510	12	3.8420
311	1.1583	7	3.8416
222	1.1091	5	3.8420
320	1.0656	3	3.8421
321	1.0268	12	3.8419
400	0.9606	<1	3.8424
410	0.9318	5	3.8419
411	0.9056	6	3.8420
331	0.8814	3	3.8419
420	0.8591	4	3.8420
421	0.8384	12	3.8420
332	0.8192	3	3.8424
422	0.7843	4	3.8323
Average unit cell from last five lines……..3.8421			