

Aufgabe 7-1:

The lattice parameter of copper is to be determined to a precision of $\pm 0.0001 \text{ \AA}$ at 20°C . within what limits must the temperature of the specimen be controlled if errors due to thermal expansion are to be avoided? The linear coefficient of thermal expansion of copper is 16.6×10^{-6} per $^\circ\text{C}$.

Aufgabe 7-2:

The following data were obtained from a Debye-Scherrer pattern of a simple cubic substance, made with copper radiation. The given $\sin^2 \theta$ values are for the $k\alpha_1$ line ($\lambda = 1.5406 \text{ \AA}$) only.

$\frac{h^2+k^2+l^2}{4}$	$\sin^2 \theta$
38	0.9114
40	0.9563
41	0.9761
42	0.9980

Determine the lattice parameter a_0 , accurate to four significant figures, by graphical extrapolation of “a” against $\cos^2 \theta$.

Aufgabe 7-3:

If the fractional error in the plane spacing “d” is accurately proportional to the function $\left(\frac{\cos^2 \theta}{\sin \theta} + \frac{\cos^2 \theta}{\theta} \right)$ over the whole range of θ (Nelson-Riley function), show that a plot of $\Delta \sin^2 \theta$ against $\sin^2 \theta$ has a maximum. At approximately what value of θ does the maximum occur?