Experiment (4): Bragg reflection :determining the lattice constants of monocrystals

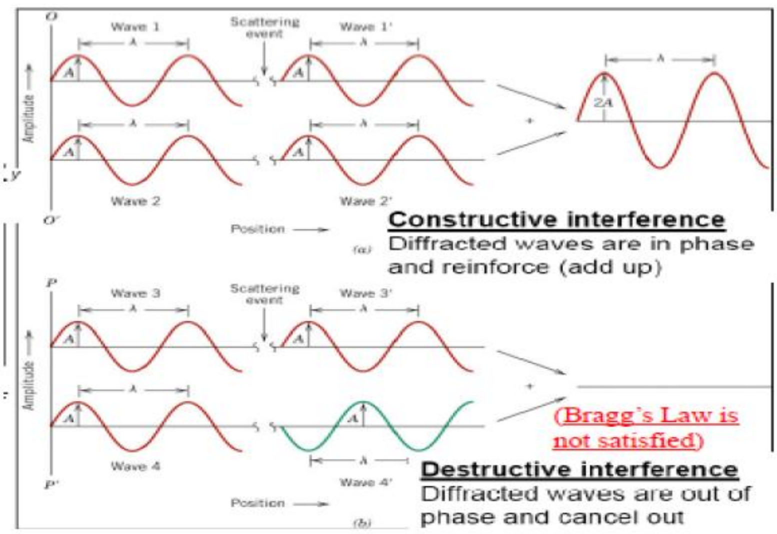
Name:………………………………………………..	**ID: …………………**	**Day:………………………**

The purpose:
1-Investagating Bragg reflection at Nacl monocrystal
2-determinig the lattice constant a0 of NaCl .

Theory:
Bragg's law of reflection describes the diffraction of plane waves at a monocrystal as the selective reflection of the waves at a set of lattice planes within the crystal .Due to the periodicity of the crystal, the lattice planes of a set have a fixed spacing d .An incident wave with the wavelength ʎ is reflected with maximum intensity when the Bragg condition is fulfilled .

$$n\lambda = 2\,d\,sin\theta \quad (1)$$

n: diffraction order.
ʎ: wavelength.
d: spacing of lattice planes.
θ: the angle of the incident and reflected waves with respect to the lattice planes.



In Cubic Nacl crystal (Fig.1), the lattice planes run parallel to the surface of the crystal's unit cell .Their spacing d corresponds to one half of the lattice constant.

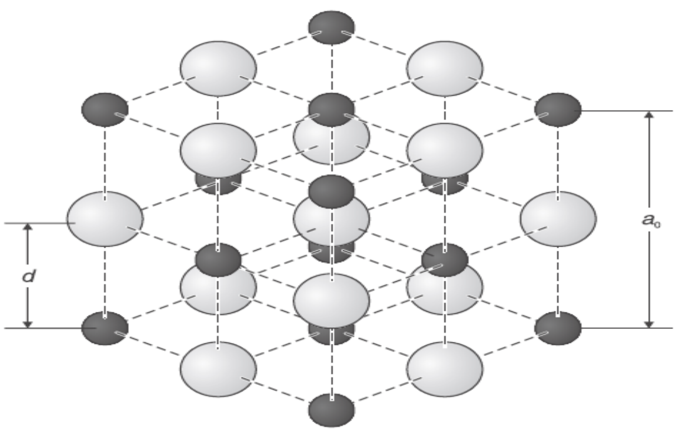


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Figure1

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$$d = \frac{a_0}{2} \quad (2)$$

substituting equation 2 in equation 1

$$n\lambda = a_0 \sin\theta$$

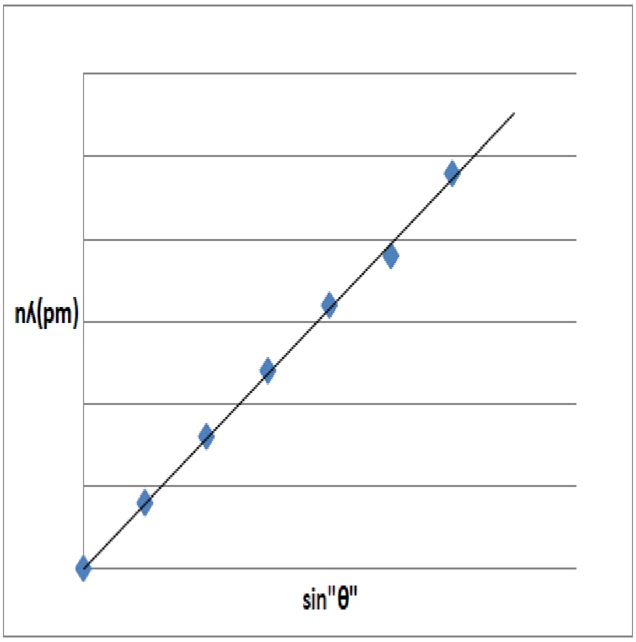
In other words, to determine a_0 we need:
to measure the glancing angle θ for a known wave length λ and diffraction order n. This method is more precise when the glancing angles are also measured in higher diffraction orders.
In this experiment, the molybdenum x-rays are used as radiation of a known wavelengths , k_α=71.08 pm and k_β=63.09 pm.

Result:

θ	sinθ	Line	n	nλ
		kβ	1	
		kα	1	
		kβ	2	
		kα	2	
		kβ	3	
		kα	3	

1- Plot nλ vs. sinθ

2- Find a_0 = slope = ---------pm



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