16/07/17

* X-Ray *

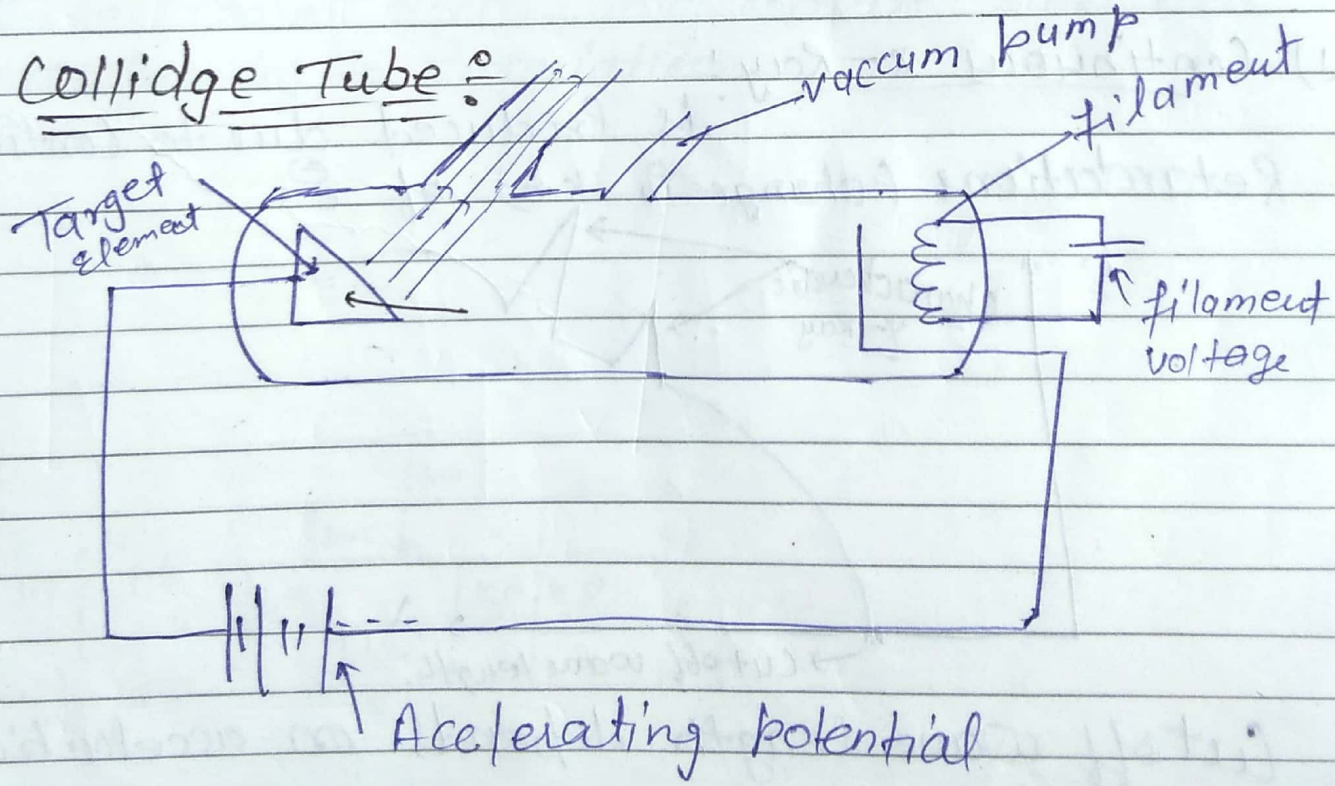
(1) Discovered by ROENTGEN
(2) X-Ray is just a reverse phenomina of Photoelectric effect

* When fast moving $e^{\ominus}$ falls on metallic surface Radiations are emitted by the metal this Phenomina is known as X-Ray

* Wavelength of X-Ray Range from 0.1A° to 10A°

* X-Rays have high Penetrating Power

* Collidge Tube :-



KE = qΔV W = qΔV

* Properties of Target Element :-

(1) High ~~spe~~ specific Heat, High melting point, High Atomic no. (Tunstan and Molybdenum used)

(2) by increasing filament potential of filament. Intensity of X-Ray or number increase.

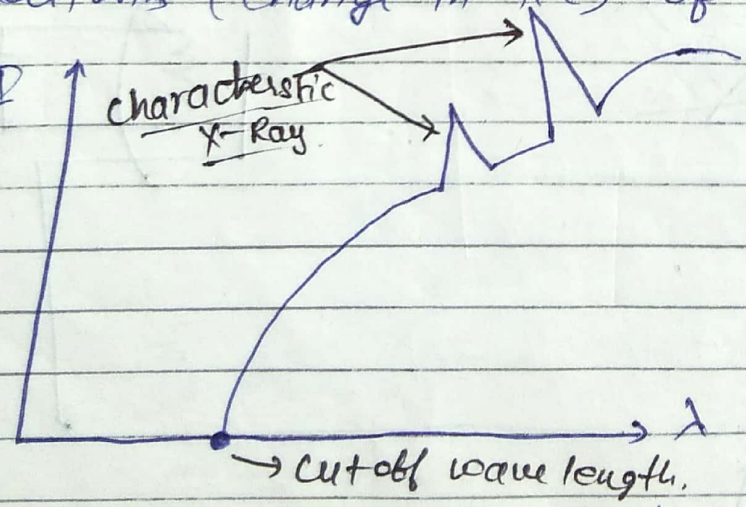
(3) By increasing accelerating potential energy of X-Ray is increased or wavelength is decreased.

(*) X-Ray can be classified into two type :

(1) Continuous X-Ray
(2) Characteric X-Ray

(1) Continuous X-Ray :-

is Produced due to Continuous Retardations (change in K.E) of e's



Cut off wave length depends on accelerating potential

Rott diff ↑

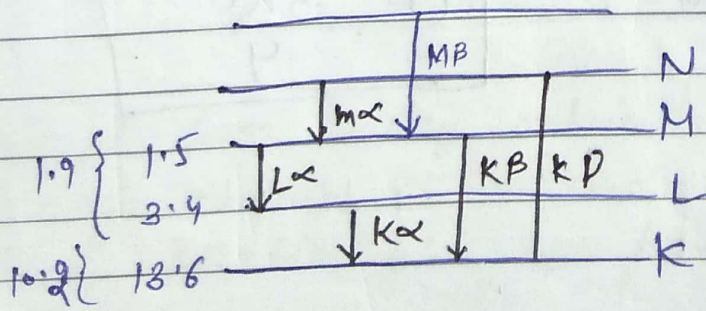
E

Cutoff wave length = $\lambda_s = \frac{hc}{\text{Energy}} = \frac{hc}{eV_A} = \frac{12400}{V_s}$

* Charactrstics X-Ray :

Shark Peak is obtain in the graph is knocons as charactrstic x-ray because they depends on charastric propeties of material

When high speed moving $e^{\ominus}$s collides with targed material they may knock out $e^{\ominus}$ from the inner shell of the matel to fill these vacant place $e^{\ominus}$ from higher energy state comes down and Radiate Radiation corresponding to transiation.



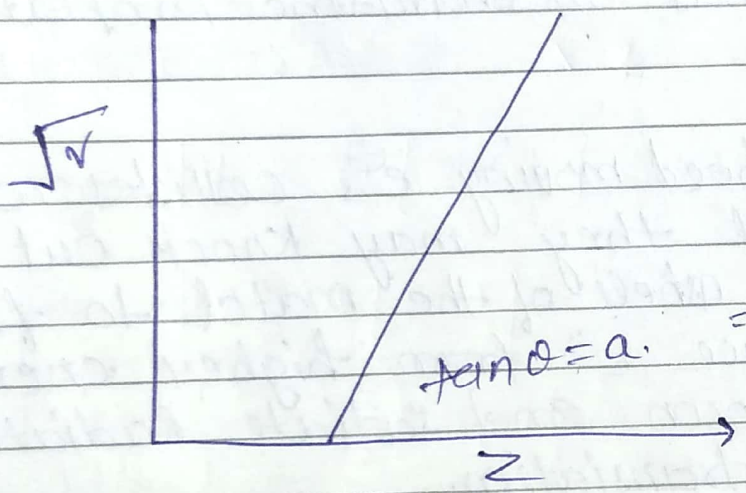
* MOSLEY'S LAW :-

$$h\nu = \frac{z^2}{n^2}$$

$$\sqrt{\nu} = a[z - b]$$ — screening const.

(frequency)

According to Mosley square root of frequency gives straight line curve against atomic no. of a target element



$$\sqrt{\nu} = a[z - b]$$

$$|\vec{\nu} = z^2 R\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$$ a

for Kα — $a = \frac{3Ra}{4}$

$$a = \frac{3RC}{4}$$

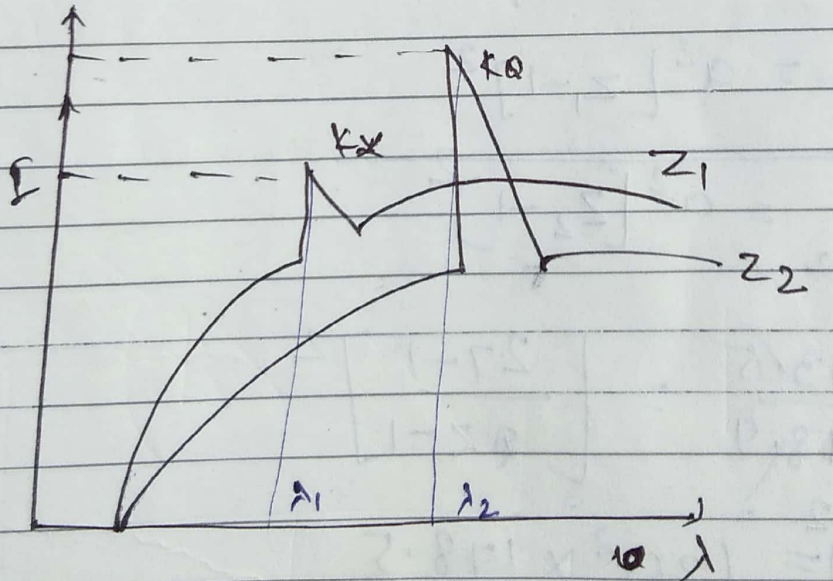
Collidge

Que: A tube operates with 20 kv acc. Potential what are the max. ~~Energy~~ Range of Energy of X-ray. Also find cut off wavelength of X-ray.

$$E = q\Delta V$$
$$= e\ 20\ kv$$
$$E = 20\ keV$$

$$\lambda = \frac{12400}{V} = \lambda = \frac{12400}{20 \times 10^3}$$
$$= \frac{12.400}{20 \times 1}$$
$$\lambda = 0.62\ A^\circ.$$

Que:



$I = \frac{nhc}{\lambda}$

graph from X-Ray obtained for two matter having atomic no. Z_1 and Z_2 are as shown find Relation b/w both atomic no.

(i) $Z_1 > Z_2$
(ii) $Z_2 > Z_1$
(iii) $Z_1 = Z_2$

$\lambda_1 < \lambda_2$

$E_1 > E_2 \Rightarrow Z_1 > Z_2$

Ques: A Cobalt target is bombarded with e^- the wave length of a characteristic spectrum are measured a second filter characteristic spectrum is also formed of an impurity in target.

Wavelength of the K_α lines is 178.9 pm for Cobalt and 148.5 pm for impurity. find impurity for K_α lines Shielding const. is 1 $Z_{imp.} > Z_{cobalt}$

~~For Cobalt~~ λ, Z

$$\sqrt{\nu} = a[Z-b]$$

$$\sqrt{\nu} = a[Z-1]$$

$$\frac{\frac{1}{\lambda_1} = a^2[Z_1-1]^2}{\frac{1}{\lambda_2} = a^2[Z_2-1]^2}$$

$$\frac{143.5}{178.9} = \left[\frac{27-1}{2Z-1}\right]^2$$

$$(Z-1)^2 = (26)^2 \times \frac{178.5}{143}$$

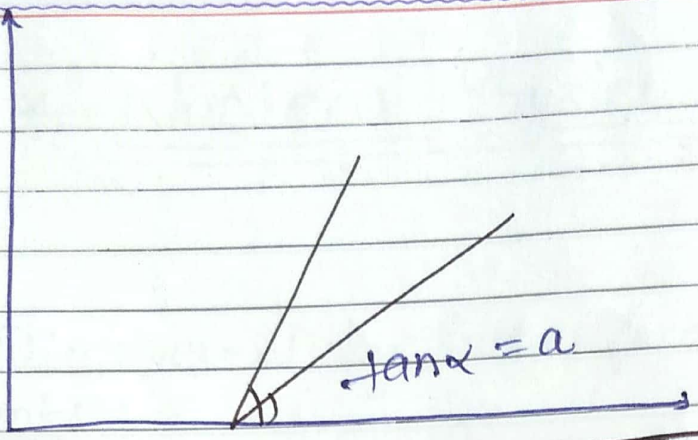
$$\frac{1773}{143} = 1124$$

$$(Z-1)^2 = 845$$

$$Z-1 \approx 29 \qquad Z = 30$$

Impurity = Zinc

Note:-



$$a = \sqrt{RC\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)}$$

R → 1.

R = Rydberg Const.

*

* Screening const. is ~~also~~ always 1 for all K_α lines.