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Q No 1 Differentiate btw Calcium tungstate Screen and Rare earth?

Ans Calcium tungstate Screens.

- ① Speed 50 - 200
- ② Conversion efficiency 5%
- ③ low absorption DQE
- ④ 20 - 200 IF
- ⑤ less Image noise.
- ⑥ Spatial resolution 15 lp/mm.
- ⑦ emit blue light - need blue sensitive film to match.

Rare Earth Screen.

- ① Speed 80 - 1200
- ② Conversion efficiency 20%
- ③ High absorption DQE
- ④ 110 - 400 IF
- ⑤ More Image noise
- ⑥ Spatial resolution 7 lp/mm
- ⑦ More expensive than Calcium tungstate.
- ⑧ Mostly emit green light, although some rare earth are blue emitters.

Qd Explain the latent image formation.

Ans **Formation of the latent image**

The image of formation x-rays exciting the patient and indicate on the radiographic intensifying screen. film deposit visible light energy in the emulsion primarily by interaction with atoms of the silver halide crystal.

=> This energy is deposited in a pattern that is representative of the anatomical part that is being radiographed.

=> An invisible image is present. However, the formation of the latent image.

### **Silver Halide Crystal:-**

=> Silver bromine and iodine atom are fixed in crystal lattice in ion form.

=> Ag to positive, bromide and iodide are negatively charge.

=> When silver halide crystal formed each Ag (silver) release an outer shell  $e^-$  which become attached to bromide or iodine ions.

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- ⇒ Silver atom missing electrons therefore to positively charged  $Ag^+$ ,  $Br^-$  and iodine base have extra  $e^-$  therefore negatively charged.
- ⇒ The bromide and iodide are found in high concentration on surface of crystal.
- ⇒ There is sensitivity centers on each have silver in vacancies called Frenkel defect.

### photon interaction with Silver Halide crystal ::

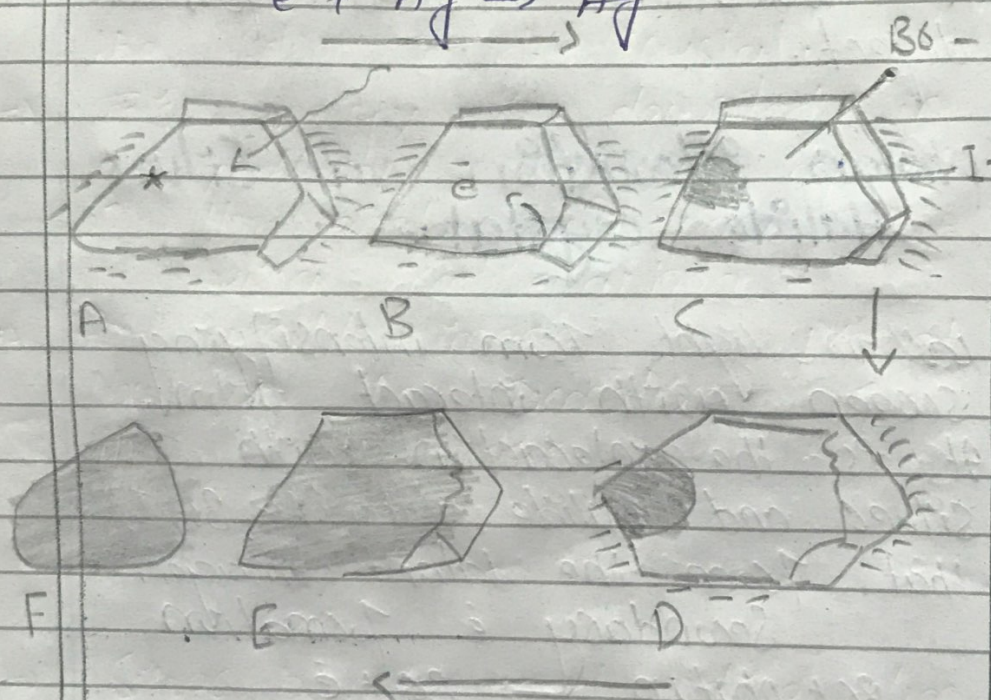
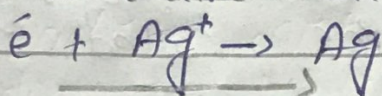
- ⇒ When light from intensifying screen with interact film, it is the interaction with silver and halide atom ( $Ag, Br, I$ ) that form the latent image.  
Secondary  $e^-$  formation  
 $Br + \text{photon} \rightarrow Br + e^-$   
These electrons are release sufficient energy to travel a large distance within crystal while crossing the crystal the electron may have sufficient energy to remove additional  $Ag$  to form crystal

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=> Secondary electron liberated by absorption of events migrated to the sensitivity center.

## Metallic Silver Formation.

=> The interstitial silver can combine with the electron trapped at the sensitivity center to form metallic silver atom.



- (A) Light photon interaction release electron.
- (B) These electron migrate to the sensitivity center.
- (C) At the sensitivity center atomic silver is formed by attraction of an interstitial silver ion.
- (D) This process is repeated many times, resulting in the

buildup of silver atom.

(e) The remaining silver halide is converted to silver during process.

(f) The silver grain results.



Q3 Briefly describe the construction of radiographic film with diagram?

Ans

**Radiographic film :-**

It is an imaging film on which x-ray image is formed. used in the radiological procedure.

**Components :-**

Mainly radiographic film is composed of two parts.

- ① Base
- ② Emulsion.

But there are some other layers too namely.

1) **Adhesive layer** :-

ensure the attachment of the emulsion with the base.

2) **Overcoat** :-  
of the protective covering  
emulsion.

### **Base** :-

- ① Also known as the foundation of the radiographic film.
- ② radiographic film based is made up of polyester.
- ③ The base of the film provide support and rigidity to the emulsion of which it can be coated.
- ④ The base can be easily handled because of its flexibility and fracture resistance feature or brittleness.
- ⑤ Thickness of the base is 150 microm to the 300 microm.
- ⑥ The base of the radiographic film is dimensionally stable and because of this property, the base does not interfere in the image distortion.
- ⑦ A base of always made transparent because of which the x-ray rays can pass through it from one emulsion to another without any interruption and the latent image formation occurs.

- ⑧ A dye is added to the film base in order to reduce the eye strain while viewing the film for diagnosing purpose.
- ⑨ Back in the days, the base was used to be made up of glass plates.

### Emulsion :-

- ① Also known as the heart of the radiographic film.
- ② Made up of gelatin and silver halide ions. That are silver bromide (98%) and silver iodide (2%).
- ③ The emulsion is also coated with thin layers whose thickness is about 3 to 5  $\mu\text{m}$ .
- ④ The gelatin used in the emulsion is the same which is used in salads but it have very high quality.
- ⑤ Gelatin provide mechanical support to the silver halide crystal.
- ⑥ Shape of the silver halide crystal depend upon the image application.
- ⑦ The exit rays the intensifying screen hit or interact with the emulsion.
- ⑧ The silver halide crystal are made by a chemical process.

- 9) By dissolving metallic silver in nitric acid. And then the formed silver nitrate with benzamide to form silver benzamide emulsion can transmit light, clear if porous fog the distribution of chemical fog the processing process.
- 10)

### Diagram -

