



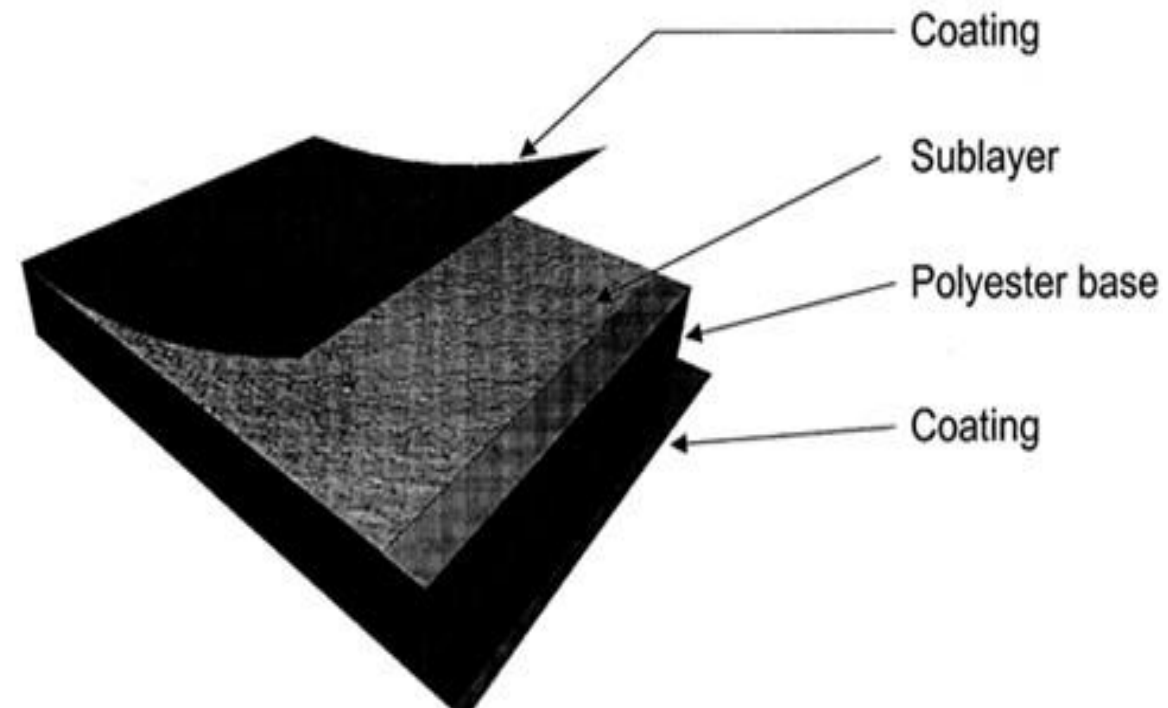
Centurion
UNIVERSITY

X-RAY FILMS

AASIF MAJEED LONE
ASSISTANT PROFESSOR
CENTURION UNIVERSITY

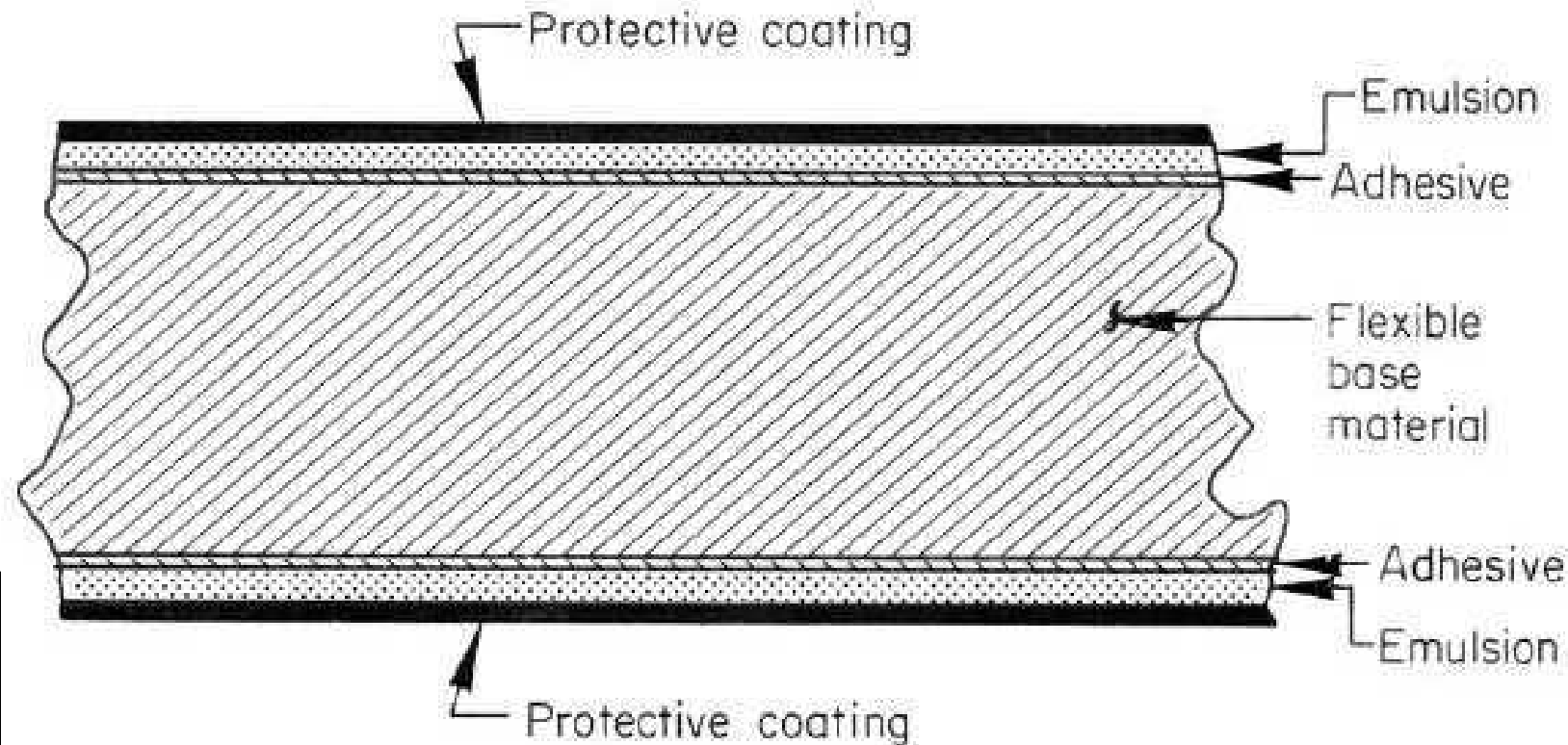
X-RAY FILM

- ❖ X -ray film is photographic film consisting of a photographically active or radiation-sensitive, emulsion.
- ❖ It displays the radiographic images of an object.

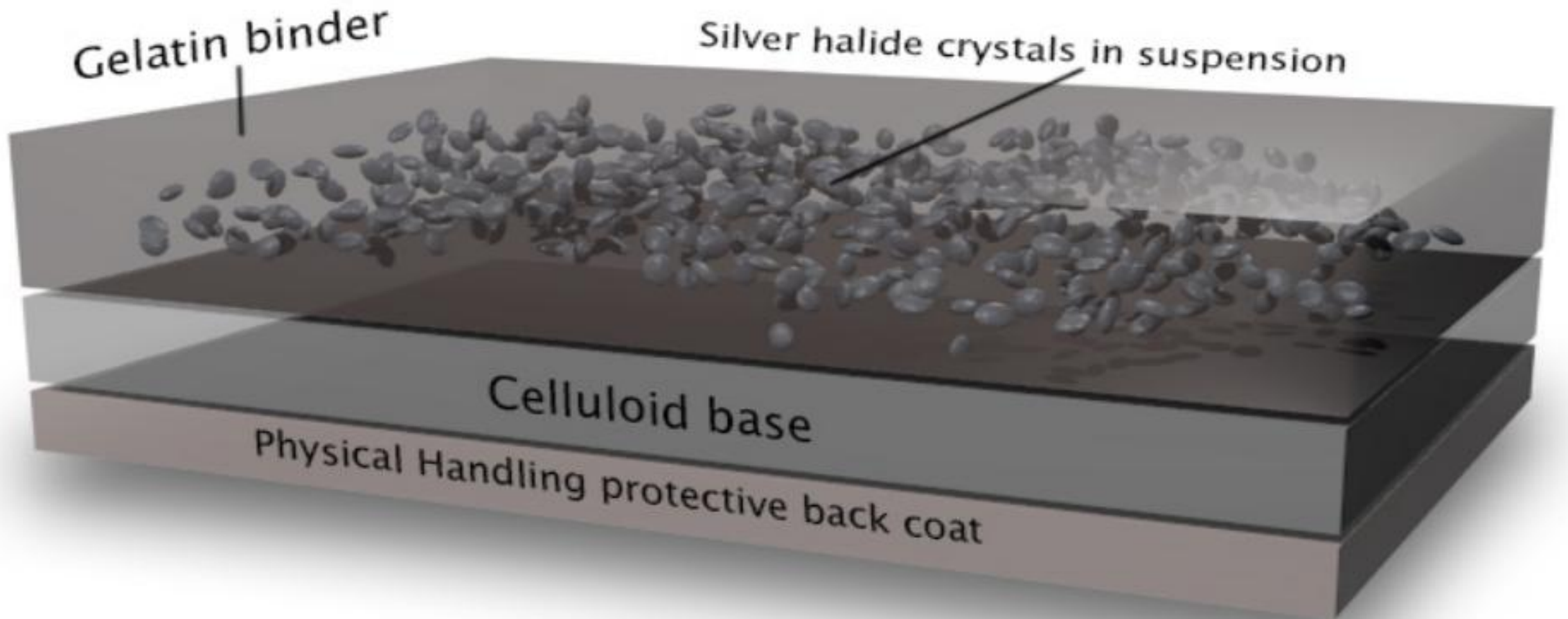


CONSTRUCTION OF FILM

- ▶ The x-ray film is made up of different layers, which are
 1. Base
 2. Subbing layer
 3. Emulsion layer
 4. Super coat



The Basic Structure Of Film

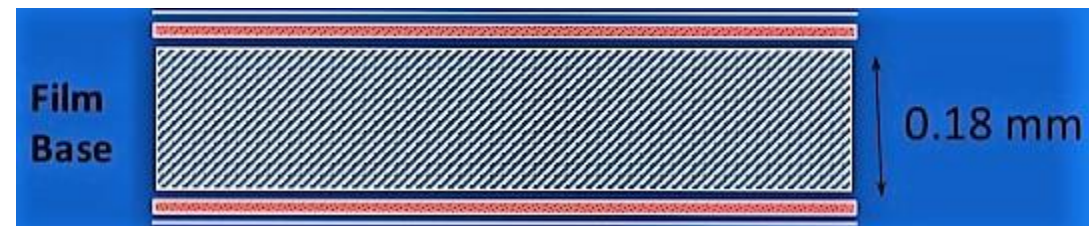


base

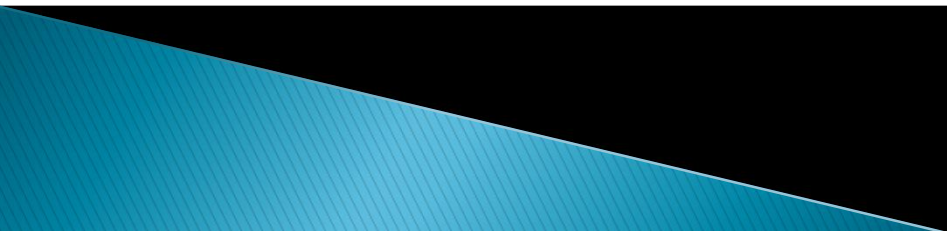
- ▶ It provide a support for the emulsion layer.
- ▶ It transmit light so that image can be viewed.
- ▶ It is extremely strong, virtually untearable and demonstrate high dimensional stability, even under the most rigorous manufacturing or processing conditions.
- ▶ Material used to make film base:
 - a. Glass Plates – used in past, thin layer of emulsion on one side.
 - b. Cellulose Nitrate – used in 1994, highly inflammable.
 - c. Cellulose Tri acetate – adopted in 1924, non-inflammable.
 - d. Polyester – adopted in 1960, made up polyethylene terephthalate resin.
- ▶ Medical x-ray films are 0.18 mm but fluoroscopy roll films are 0.25 mm.

Characteristics of base

- ▶ Transparent
- ▶ Flexible
- ▶ Untearable
- ▶ Uniform thickness and colour
- ▶ Impermeable to water and processing chemical
- ▶ Non-inflammable
- ▶ Chemically inactive
- ▶ Dimensionally stable throughout processing



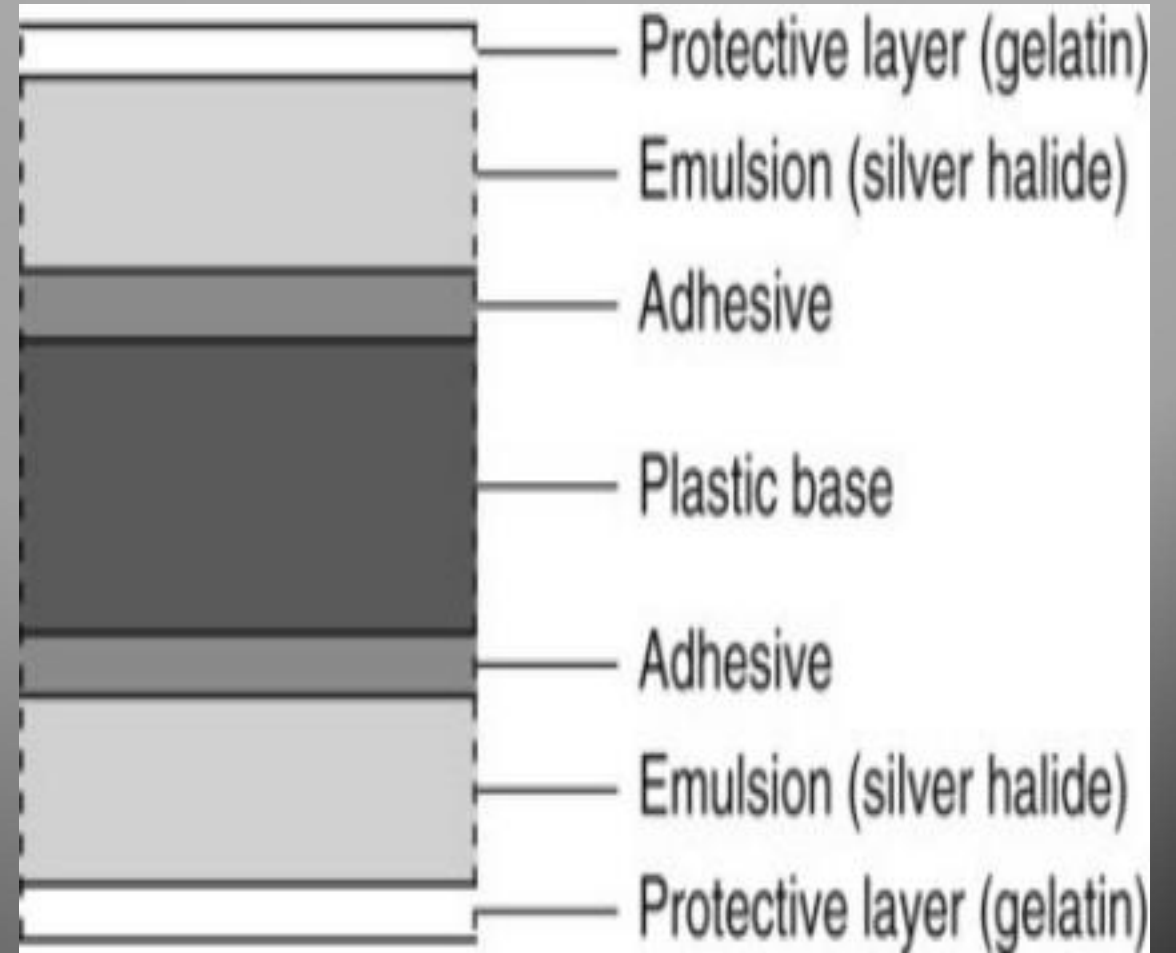
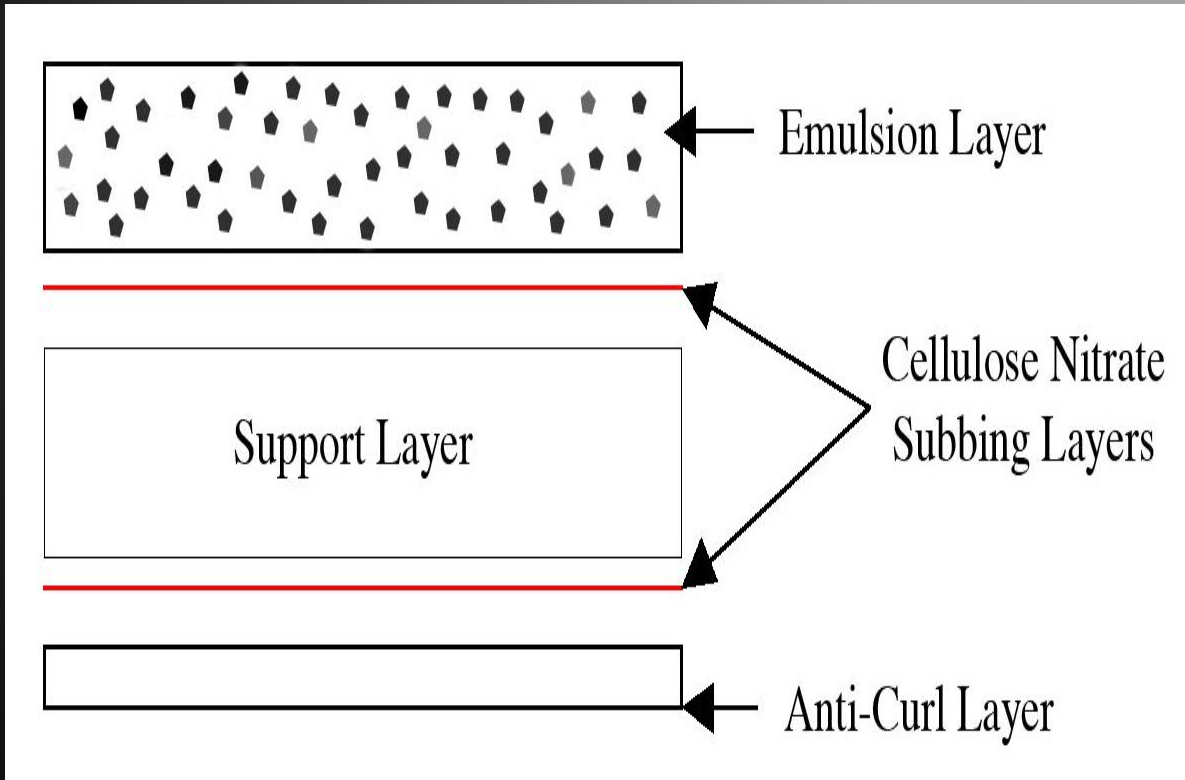
Subbing layer

- ▶ Also known as adhesive or substratum layer, required between the base and the emulsion.
 - ▶ It ensure adherences of emulsion layer to the smooth and shiny base material during coating stage in manufacture.
 - ▶ It prevent any separation of the emulsion layer from base during processing.
 - ▶ It is a mixture of gelatine solution and solvent of the film base.
 - ▶ The coloured dye may be added to eliminate the crossover or transmission effect.
- 

Emulsion layer

- ▶ Emulsion is an active layer of the film.
- ▶ Photographic emulsion consist of gelatine and silver halide.
- ▶ Silver halides crystal contain 90% silver bromide and 10% silver iodide.
- ▶ Its thickness varies with the film type but is usually no thicker than 0.5 mm.
- ▶ A thicker emulsion would not be useful because of the inability of light to penetrate to the deeper layers.
- ▶ Kodak uses T- Grain technology in emulsion layer, increase sensitivity and there by its speed.
- ▶ A light absorbing dye magenta dye is added to the surface of grain to further increase the sensitivity of layer and absorbing irradiated light within the emulsion.


emulsion



Super coat layer

- ▶ It is a thin layer of clear gelatine which is applied to the emulsion.
- ▶ It has two prime functions:
 - a. It protect the sensitive emulsion from the effects of light pressure or abrasion which might occur during use. It results dark spots or patches on the processed film. It is sometime called as anti- abrasive layer.
 - b. It provide suitable surface characteristics.

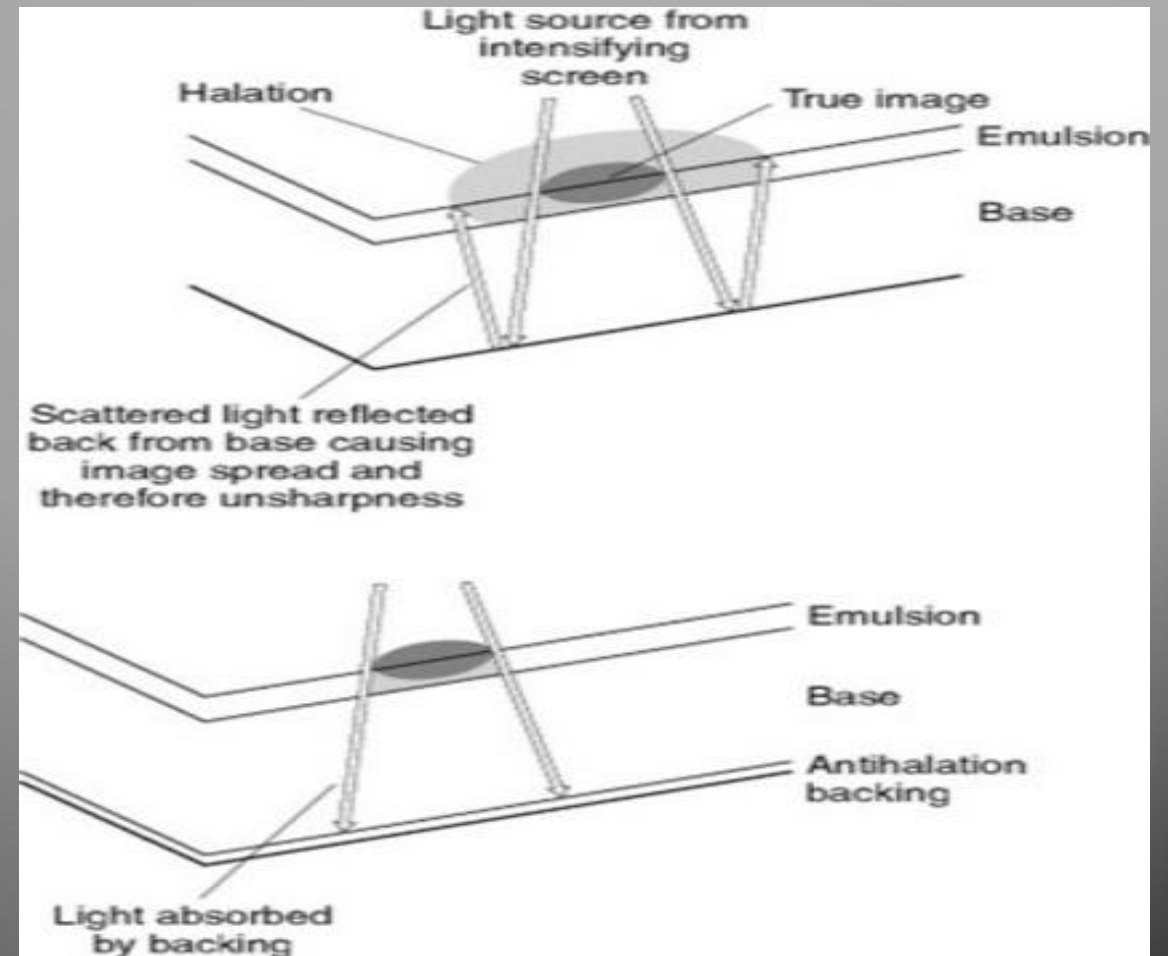
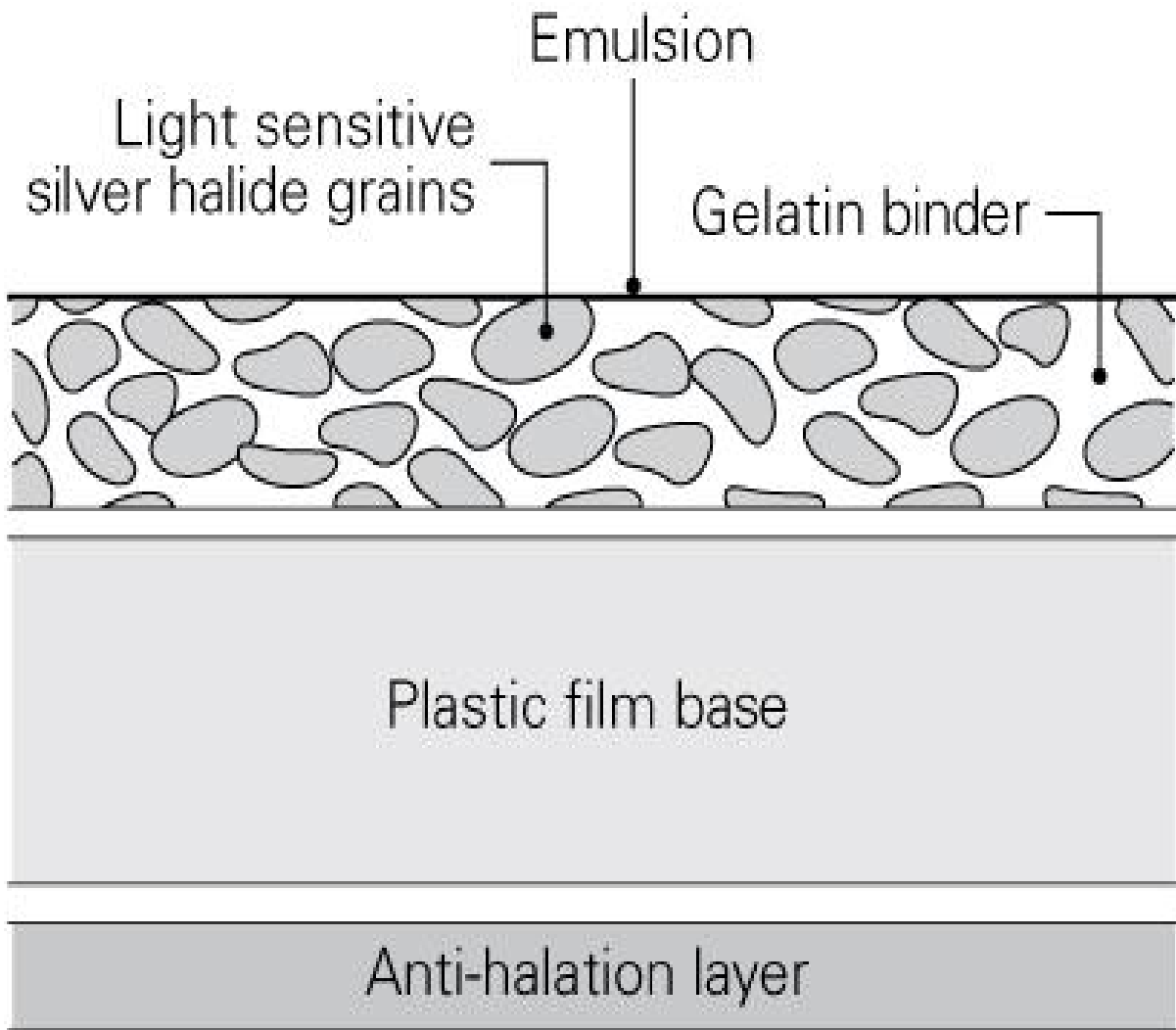
Non-curl backing

- ▶ It is only present in single-sided emulsion sheet films.
 - ▶ During processing the emulsion layer swell up, the film as a whole tendency to curl.
 - ▶ To prevent curling tendency of film, the emulsion layer is balanced by coating the base on the opposite side.
 - ▶ Firstly it is coated with subbing layer and then with a layer of gelatine.
 - ▶ It is similar thickness with emulsion stratum and has absorbent qualities.
 - ▶ It is not present in roll films.
- 

Anti-halation layer

- ▶ During image formation, some of the incident light pass the emulsion and reach the base.
- ▶ The light may either pass out or totally be reflected back towards the emulsion.
- ▶ Such reflected light will produce a diffuse image or halo around the proper image.
- ▶ This phenomenon is known as halation.
- ▶ It is present in single-sided emulsion film and might be occur in duplitized emulsion.
- ▶ Method of preventions:
 - a. Adding a dye to non-curl backing
 - b. base

halation



Types of x-ray films

Duplitized Emulsion Films

- A. Direct Exposure Film
 - 1. Intra-oral dental films
 - i. Periapical
 - ii. Occlusal
 - iii. Bitewing
 - 2. Kidney surgery film
 - 3. Radiation monitoring film
- B. Screen Types Films

Single-sided Emulsion Films

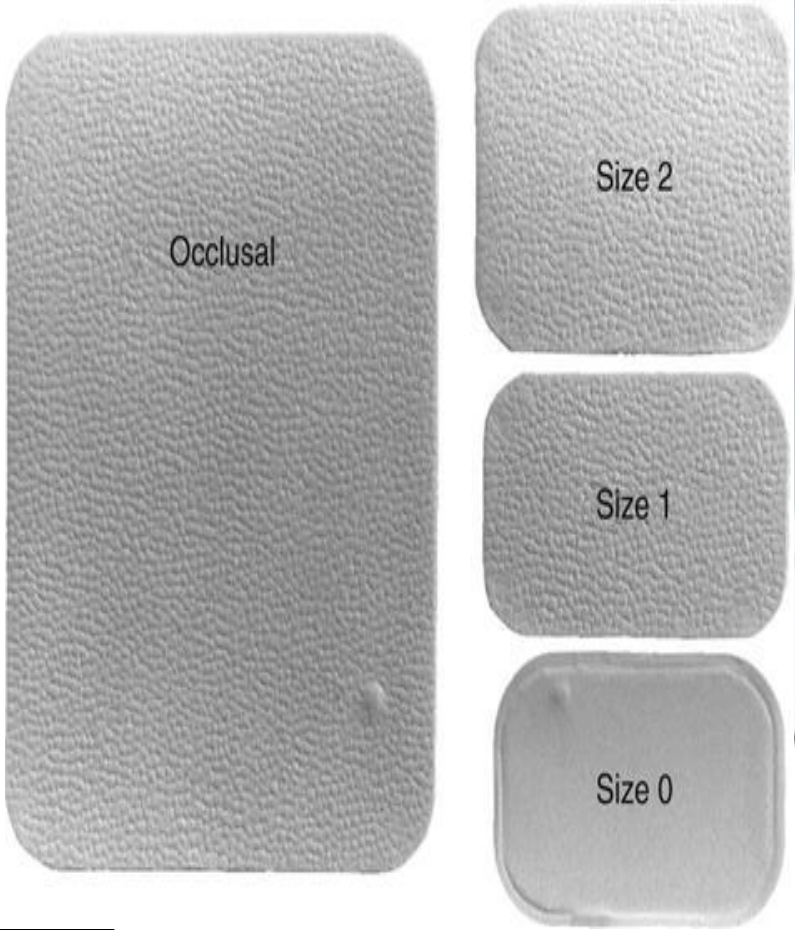
- A. Screen-Type Film
- B. Duplication Film
- C. Subtraction Film

Intra-oral dental films

- i. Periapical – 31 × 41 mm, use for single or group of teeth.
- ii. Occlusal – 57 × 76 mm, for imaging mandible or maxillae in the occlusal plane.
- iii. Bitewing – 31 × 41 mm, use for demonstrating the crown.
it has custom-made flap to position vertically behind the upper and lower teeth, the patient biting the flap.



Dental films



WRAPPING

- ▶ The outer waterproof packet protect the film from moisture, while the paper insert afford some protection from pressure.
- ▶ Lead foil insert act as a attenuator of back-scattered radiation.
- ▶ It is little thicker emulsion than ordinary duplitized film
- ▶ The tube side has embossed dot.



— Inner paper

— Dental film

— Inner paper
wrap

— Lead foil
backing

— Outer package

Dental radiography



Screen-type film

- ▶ It is used in conjunction with pairs of intensifying screens.
- ▶ Latent image produced by light emission from screen phosphors.
- ▶ A wide range of films are available:
 - a. Blue-sensitive film (monochromatic)
 - b. Green-sensitive film (orthochromatic)
- ▶ These film have varying in speed, contrast, latitude and resolving power.

Sizes of screen-type films

- ▶ 13 × 18 cm
- ▶ 15 × 30 cm
- ▶ 15 × 40 cm
- ▶ 20 × 40 cm
- ▶ 18 × 24 cm
- ▶ 30 × 40 cm
- ▶ 35 × 35 cm

Single-sided emulsion film




Screen-type film

- ▶ It is used in conjunction with a cassette fitted with a single intensifying screen.
- ▶ The films are medium to high contrast with definition, capable of demonstrating micro calcification in soft tissue.
- ▶ It is use in mammography.

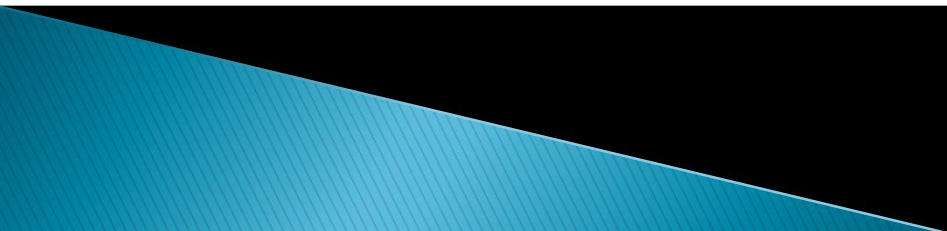
Duplication film

- ▶ It is used to make a copy of a radiograph.
- ▶ The radiograph to be copied is placed in intimate contact with a special film material known as duplicating film.
- ▶ The film is exposed to uv light through the original radiograph and the result after processing is a radiograph which is identical to the original.
- ▶ It is a single coated film which is having reversal characteristics.
- ▶ It has anti-halation layer which dissolve away during processing.
- ▶ It is available in the ranges of sizes.
- ▶ It is available in the ranges of sizes and automatic processing.

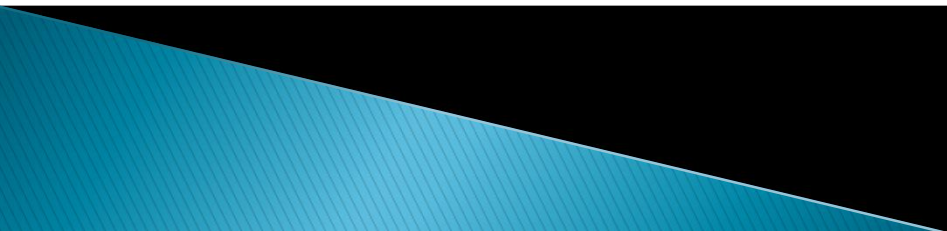
Subtraction film

- ▶ It is used in angiography.
 - ▶ It is having single sided emulsion to minimize photographic unsharpness.
 - ▶ It is having anti-halation layer.
 - ▶ It has polyester film base suitable for automatic processing.
 - ▶ It is mainly available in 12" × 15" and 14" × 17" format.
- 

Computed radiography

- ▶ It was introduced in the 1970's.
 - ▶ The diagnostic x-ray images are acquired in a digital format.
 - ▶ It uses phosphor plate which exhibit photon stimulated luminescence.
 - ▶ A phosphor-coated imaging plate replace the scree-film system.
 - ▶ The imaging plate has high sensitivity to x-ray, good resolution and offers a novel method of image formation with potential for further development.
- 

Photostimulable phosphor plate

- ▶ It looks like conventional intensifying screen.
 - ▶ It contains Barium fluorobromide and Barium fluoroiodide crystal.
 - ▶ It is activated with small amount of Europium.
 - ▶ Doping of Europium create defects to trap the electrons.
 - ▶ The defect form here is called F-center.
 - ▶ The light emitted by phosphor crystal are in blue spectrum region.
 - ▶ PSP plate are thermoluminescent in nature.
- 

Psp plate



Overcoat

Phosphor Layer

Estar Support

Black Cellulose Acetate

Lead Backscatter Control

Aluminium Honeycomb Panel

Principle of cr

1. Exposure to x-radiation
2. Stores pattern of energy from x-ray beam as latent image
3. PSP plate is placed in readout unit
4. It is stimulated by He-Ne laser light of diameter 100 μm .
5. The phosphor stimulated and store energy is release in visible light.
6. The light is conveyed to PMT by fiber optic light guide.
7. PMT generates electronic signal and it is digitized and stored

THANK YOU...