ProductInformation

FILM, KODAK X-MAT
Product Number **F5263, F5388, F5513, Z35848-7, Z35849-5, Z35858-4, F5763, F5888, F5014, F5138**

Synonyms: XAR-2 (F5763, F5888, F5014), XAR-5 (F5513, F5388, F5263, Z35848-7, Z35849-5, Z35858-4), XAR-351 (F5138)

Product Description
A general-purpose film with emulsion coated on both sides of a clear film base. Suitable for most autoradiography applications using low-energy or high-energy isotopes. Signal from high-energy isotopes can be increased by using in combination with intensifying screens. Suitable for chemiluminescence.

The film supplied under all three film types, XAR-2, XAR-5, and XAR-351, is the same. The difference between the three types is the packaging method. XAR-2 is packaged with each sheet of film in a light-protected envelope, XAR-5 has 50 sheets of film in a single foil envelope, and XAR-351 is a 25-meter roll, which can be cut to the desired length.

Storage/Stability
X-OMAT film may be stored safely at room temperature. The shelf life can be extended by storing at 4°C. If stored at 4°C allow to warm to room temperature before opening the box. As film ages the background, called fogging, slowing increases. This is caused by the oxidation of the silver in the emulsion. Storing at a lower temperature slows the development of background fogging.

Safelight
The GBX-2 Safelight Filter (F9515) is recommended for darkroom handling of X-OMAT films. A Kodak 6B Safelight Filter (F9895) is also suitable.

Use a 7.5 Watt frosted bulb in the safelight placed at least four feet from the film handling area.

Procedure
Direct Exposure: For most autoradiography applications the direct exposure method is used. ^{14}C, $^{3}5S$, and ^{32}P are isotopes commonly used in this technique. The labeled dry sample is placed directly on the film and placed in an exposure cassette. If the sample is a damp gel we recommend placing a layer of plastic wrap between the film and sample.

Indirect Exposure: This technique is used for weak energy isotopes such as ^{3}H. In many samples the emission from these isotopes is quenched trying to get out of the sample. If the sample is overlaid or impregnated with a fluor. The fluor inactivated by the isotope and re-emits the energy as visible light which exposes the film. Commonly used fluors are 2,5-Diphenyloxazole (D4630) or Sodium Salicylate (S3007). They are usually used with ^{3}H but can be used with ^{14}C and ^{35}S.

Chemiluminescence: In the process the sample is treated with reagents to perform a series of reaction, the end result of which is emission of visible light. The light exposes the film.

Because most exposures require an extended period of time the film and sample are placed in an exposure cassette. If no intensifying screen is used simply place the sample on the film in the cassette. If an intensifying screen is used the film should be placed on the screen and the sample placed on the film. The film is sandwiched between the screen and the sample.

Intensifying screens will enhance the signal of strong emitters like ^{32}P. As seen in the diagram the beta particles from the isotope may or may not expose the film as they pass through. An intensifying screen opposite the sample will capture the radiation that passes through and re-emit the energy as visible light to expose the film. In general a second screen on the other side of the cassette will not improve signal significantly. The light generated would have to pass through the sample to expose the film and especially if the sample is a piece of nitrocellulose or nylon, these would be opaque and little light would pass through. The energy of weaker isotopes such as ^{14}C or ^{35}S are generally not strong enough to pass through the film to activate the screen. In these cases a screen is not needed.

Exposure Temperature: In the case of weak signals placing the assembled exposure cassette at -70°C can improve the signal. A silver grain must absorb three photons of energy to be stable. If there is too much time between absorption of the first and third photon the unstable 1- or 2-photon stage can lose a photon and the exposed state takes longer to stabilize. Placing the film and sample at -70°C helps stabilize these complexes giving a longer time to get the needed third photon. The times involved are not available. This

holds only for very weak signals. Strong signals are not generally improved significantly by -70°C exposure temperatures. Users may want to test this in their laboratories.

Processing Procedure: X-Mat films can be processed manually or by an automated processor.

Automated Processing: See the manual for your instrument for processing instructions. Sigma offers Kodak Processing Chemicals for automated processing.
RP X-OMAT Developer/Replenisher (Z35409-0)
RP-X-OMAT LO Fixer/Replenisher (Z35410-4)
RP-XOMAT Developer Starter (Z35411-2)
Developer System Cleaner (Z35412-0)
Fixer/Wash System Cleaner (Z35413-9)

Manual Processing: There are two different methods of processing these films manually, Tray of Deep Tank. The only difference between the two methods is in the volume of processing chemicals used.

The tray method employs three trays that are at least 2-3 cm longer and wider than the film to be processed. One tray is for development, one for rinsing between development and fixing, and one for fixing. The film is moved from one tray to the other with print tongs.

The Deep Tank method generally uses two or three 5-gallon tanks in a water bath to help regulate the temperature of the solutions. The film is placed in film hangers to move it from one tank to the next.

Processing times are the same no matter which manual processing method is used. The recommended processing temperature for development is 20°C, for rinsing, fixing and washing should be 16-24°C the temperature of all solutions should be close to the same. Extreme differences can lead to damage to the film emulsion. Processing times and temperatures should be a constant in the process. If a different signal strength is desired the exposure time for the film is the recommended parameter to vary.

Development: Place the film in GBX developer for 5 minutes with moderate agitation for 5 seconds every 60 seconds. Agitation is accomplished by gently rocking the tray or moving the film hanger up and down in the deep tank method. The developer should be replenished at a rate of 60 ml Developer/Replenisher for every 35 X 43 cm sheet of film processed in tray or tank.

Rinsing: Rinse in Kodak Indicator Stop Bath (P7292) or running water for 30 seconds with moderate constant agitation.

Fixing: Place film in GBX fixer for 5-10 minutes with moderate agitation for 5 seconds every 60 seconds. The fixer should be replenished at a rate of 75 ml Fixer/Replenisher for every 35 x 43 cm sheet of film processed in tray or tank.

Wash: Place film in running water, with a change rate of 8 volumes/hour, 5-10 minutes.

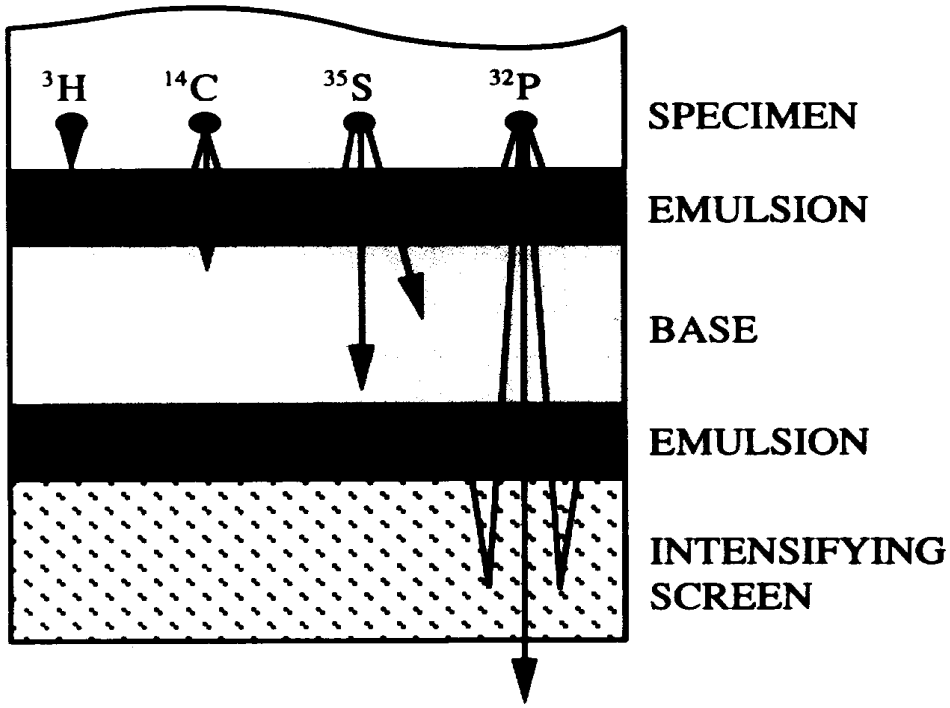
Dry: Hang in a dust-free area to air dry. An optional post-wash rinses in Photo-Flo 200 (P7417) for 30 seconds before drying allows the film to dry essentially spot free.

Notes:
1. As the developer is used it will become yellow in color. This is normal. If the developer becomes too yellow it will have lost much of its developing ability.
2. As fixer is used and ages it can form a precipitate. If the amount of precipitate is small decant and use the supernatant.
3. The purpose of the fixer is to remove unexposed silver form the emulsion. If after the normal fixing time the film still seems to have a film of emulsion remaining place the film back in fresh fixer for about 5 minutes to complete the fixing process. Do not be concerned if this has been observed in room light. The film will not fog if only the fixing process is performed.

References

Autoradiographic Detection Principles. Kodak Bulletin SI-100. Copyright 1/93.

Intensifying Screen Exposure



Direct Exposure

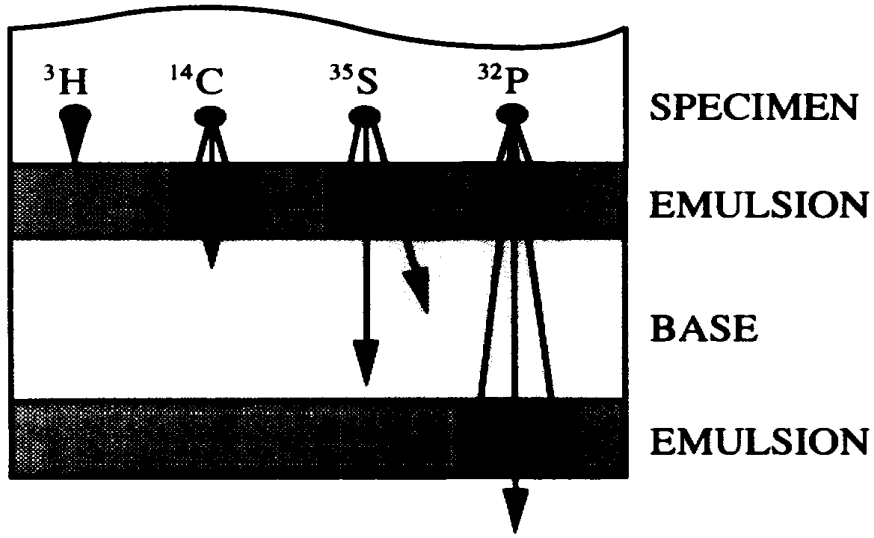


Figure 11. Illustration of Penetration of Radiation into X-ray Film.

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