

KODAK Autoradiography Emulsion, Type NTB, for Light Microscope Autoradiography

Scientific Imaging Systems of Eastman Kodak Company manufactures a nuclear-type recording material for use in autoradiography at the light microscope level. This product is supplied in gel form for use as a liquid emulsion. Included in this publication is information on the characteristics, general handling, and processing of this emulsion. This information will help you achieve the reproducibility which is necessary if you are to have confidence in your autoradiography results.

Characteristics of KODAK Autoradiography Emulsion, Type NTB, for Microautoradiography

The nuclear-type emulsion manufactured by Kodak is specifically designed to facilitate microscopic examination of individual silver grains in the developed emulsion layer, and thus confirm the passage of ionizing radiation. The product characteristics, therefore, include fine grain, fairly uniform grain size distribution, a very high ratio of silver grains to gelatin, and a very low level of background fog.

The emulsion can be used in autoradiographic investigations with β and γ emitting isotopes, but varies in the sensitivity to these radiations.

Emulsion

Many factors influence the performance of emulsion and/or technique used. This includes: the isotope used; characteristics of the labeled compound; nature of the specimen; and the kind of results desired.

When duplicating or extending previous results, we advise using the same technique as the initial investigation. Changes require additional experiments to provide sufficient crossover data to ensure continuity.

The sensitivity of the emulsion is related to the linear energy transfer (LET) of the radiation being detected. As the energy of the radiation increases, the energy loss per unit track length (1/LET) decreases. Thus, the number of silver grains produced per unit track length also decreases. The sensitivity limit for nuclear emulsion is, therefore, defined as the maximum energy at which a recognizable track of exposed silver grains is produced (see table 1).

Table 1

KODAK Autoradiography Emulsion	Catalog Number	Mean Grain Diameter μm (Undeveloped)	KODAK Safelight Filter
Type NTB	889 5666	0.40	KODAK Darkroom Illumination



Scientific Imaging Systems

KP101268b
KODAK Products for Light Microscope Autoradiography
t.s. 6 x 7 in. /Helvetica Neue family/Symbol/Optima
KC# 14413 8/30/04 Mechanical

Storage

The nuclear track emulsion must be refrigerated at +4 to +13°C (39-55°F) until use. If frozen or stored at room temperature, it will deteriorate, resulting in high background fog or loss of the ability to coat slides. After coating, the dried slides can be stored at room, refrigerator, or freezer temperatures. The emulsion is expiration-dated. Beyond this date background fog levels may become unacceptably high.

Emulsion Handling and Slide Preparation

The autoradiography emulsion, while often called "liquid" emulsion, is actually in solid form and must be liquefied before use. Under recommended safelight conditions (see Table 1), remove the bottle from the box and place it in a water bath between 43 and 45°C (109-113°F). Liquefaction should take about 45 to 60 minutes. Gentle movement of the emulsion will speed this process. Too much agitation can lead to the formation of microscopic bubbles in the emulsion, which can be difficult to remove.

The autoradiography emulsion is ready for use as received. Because of the possibility of contamination, we do not recommend, nor approve, adding anything to this emulsion. However, if you must add water and/or surfactants, test the altered emulsion to make sure the background fog levels have not been affected.

The emulsion layer thickness and uniformity will depend upon many factors such as: temperature of the emulsion and the slides; rate of withdrawal of the slide from the emulsion; whether the slide is allowed to drain in a vertical position or is immediately placed horizontally; and whether the emulsion has been diluted. Use of a reproducible slide-dipping procedure will give emulsion layers a uniform thickness. The investigator must adjust the parameters to suit his or her specific requirements for thickness and uniformity of the emulsion layer.

Exposure Considerations

Prepared slides should be placed in a light-tight box with a drying agent and placed in a refrigerator at 5-10°C (41-50°F) during the exposure period. The drying agent helps to maintain a low humidity condition in the storage box. Low temperature and humidity decrease latent image fading and the effects of chemical interaction between the specimen and emulsion layer.

Chemical interaction between the specimen and the emulsion may either increase background fog or increase latent image fading. To control for these effects, process pairs of slides, with and without specimens, at various lengths of exposure.

Exposure time must be determined empirically for each experiment. Prepare extra slides and periodically check the production of grains or tracks. Monitoring of chemographic effects and the background fog level can be done while determining when the exposure period should be terminated.

At the end of the exposure period, allow the slide boxes and their contents 2 to 3 hours to reach room temperature before unsealing the boxes. This will prevent moisture from condensing on the surfaces of the cold slides.

Processing Instructions

The processing procedures listed in Table 2 on the next page are intended to serve as starting points only. The developer dilutions, development times, and processing temperatures can be modified to suit individual practice and experimental requirements. Standardized chemicals, temperatures, and processing procedures are required for repeatable results. Be sure to handle unprocessed photographic material under the proper safelight conditions.

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Table 2: Photographic Processing Protocol for KODAK Autoradiography Emulsion, Type NTB

Use all processing solutions at a temperature of 15°C (59°F) for the times recommended in this table.
Use no agitation.

Step	Recommended Solution	Time
1. Develop	KODAK DEKTOL Developer (1:1) or KODAK Developer D-19 (1:1) (1:1 - One-to-one dilution with water)	2 minutes 4 minutes
2. Stop*	Distilled Water	10 seconds
3. Fix**	KODAK Fixer	5 minutes
4. Wash	Distilled Water	5 minutes
5. Dry	Slowly in a dust-free atmosphere	

* Do not use acid stop baths since they could result in the formation of microscopic bubbles in the emulsion layer.

** Do not use rapid fixers (ammonium) since they could result in loss of developed silver grains.

Additional Information

For technical assistance:

Contact our Web site: www.kodak.com/go/scientific, or phone 1-877-SIS-HELP (outside the U.S. 1-203-786-5657), fax 1-203-786-5656, or email: sis-support@kodak.com.

Processing Chemicals

KODAK Fixer and KODAK DEKTOL Developer and/or KODAK Developer D-19 are available through your local photographic dealer of Kodak products.

Product List

Cat. No.	Description	Unit Size
889 5666	KODAK Autoradiography Emulsion Type NTB	118 mL (4 oz.)
146 4726	KODAK DEKTOL Developer	1 gallon
146 4593	KODAK Developer D-19	1 gallon
197 1753	KODAK Fixer	1 gallon
113 2752	KODAK Darkroom Illuminator	North American Socket E26, 115V
897 4917	KODAK Darkroom Illuminator	European Socket E27, 230V
155 6208	KODAK Darkroom Illuminator	UK Socket BA 22, 230V

Ordering Procedures

KODAK Autoradiography Emulsion, Type NTB orders can be accepted by fax, mail, or phone. Domestic orders (USA) may be placed as follows:

Mail: Scientific Imaging Systems	Phone: 800-225-5352
Eastman Kodak Company	585-588-2572
343 State Street	Fax: 800-879-4979
Rochester, NY 14652-5126	Outside U.S.: 585-477-8040

In the U.S., emulsions are shipped Monday through noon on Thursday by air freight directly to the customer.

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International Orders

International orders are accepted by the distributors listed in our Web site. Please visit www.kodak.com/go/scientific for a dealer in your area.

***Product must be refrigerated at +4 to +13° C (39-55° F) upon arrival.
Product must not be frozen, and must be protected from penetrating radiation.***

Scientific Imaging Systems
Eastman Kodak Company
Rochester, NY 14652-5126

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