

Fluorescent Lamp Colour 175 Natural Super



The choice for the lighting
of meat products

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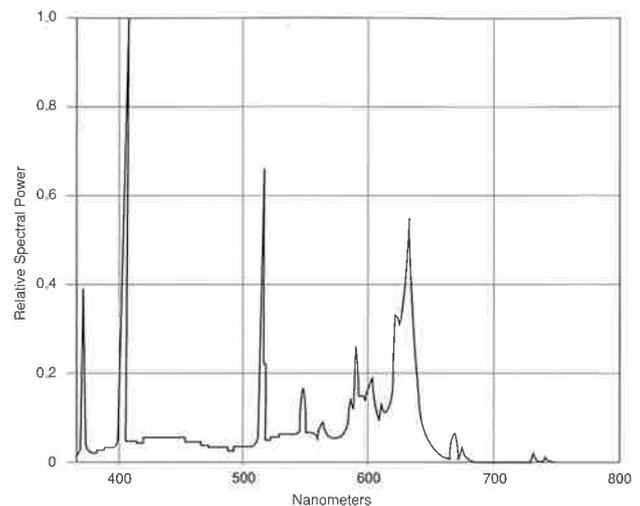
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Fluorescent Lamp Colour 175. Natural Super The choice for the lighting of meat products

Fluorescent lamp colour 175, Natural Super is a fluorescent powder combination specifically adapted to the requirements of display lighting of meat products.

The high colour rendering index of 88 Ra at a colour temperature of 3900 K assures a natural and undistorted appearance of the produce.

The spectral power distribution is engineered for low radiation in the sensitive range of wavelengths between 510 and 635 nanometers, which is important to maintain the colour and the nutritive value of meat products by assuring low rates of photochemical change.



Colour Temperature 3900 K
Colour Rendering Index 88 Ra

Meat Products and Pigment Chemistry

Myoglobin

The surface of freshly cut beef has a blueish-red colour. The pigment which gives us this colour is called myoglobin, which is also a protein and therefore part of the food value of the meat.

Myoglobin Oxigenation

Similar to haemoglobin which gives the colour to blood, myoglobin can absorb oxygen. When we leave freshly cut meat exposed to air (oxygen) for a while, the colour will change to a bright red. We then call the pigment oxy-myoglobin.

For the appearance of the meat product but more so for its food value, we have an interest in maintaining the pigment in these two forms, myoglobin or oxy-myoglobin.

Myoglobin Oxidation

Extended exposure of the meat products to air (oxygen) and improper storage conditions, such as too high temperatures, the presence of bacteria and fungi, high illuminances and unsuitable light sources, will lead to the oxidation of the myoglobin to form met-myoglobin.

This is of brownish colour and, with further reactions, greenish pigments will also form. For appearance and the food value of the meat product, it is important to avoid the formation of met-myoglobin.

These reactions are the same for various types of fresh meat such as beef, veal, pork poultry etc. The varying colour of cuts, or colour differences on the surface of the same cut depend on the concentration of the pigment.

Processed Meats

Nitricoxide-Myoglobin

The reactions are different for processed meat. In general the fresh meat is cured first in a mixture of salts (sodium-nitrate and sodium-chloride) and the nitrous acid will change the myoglobin to nitricoxide-myoglobin. This pigment is of pinkish-red colour.

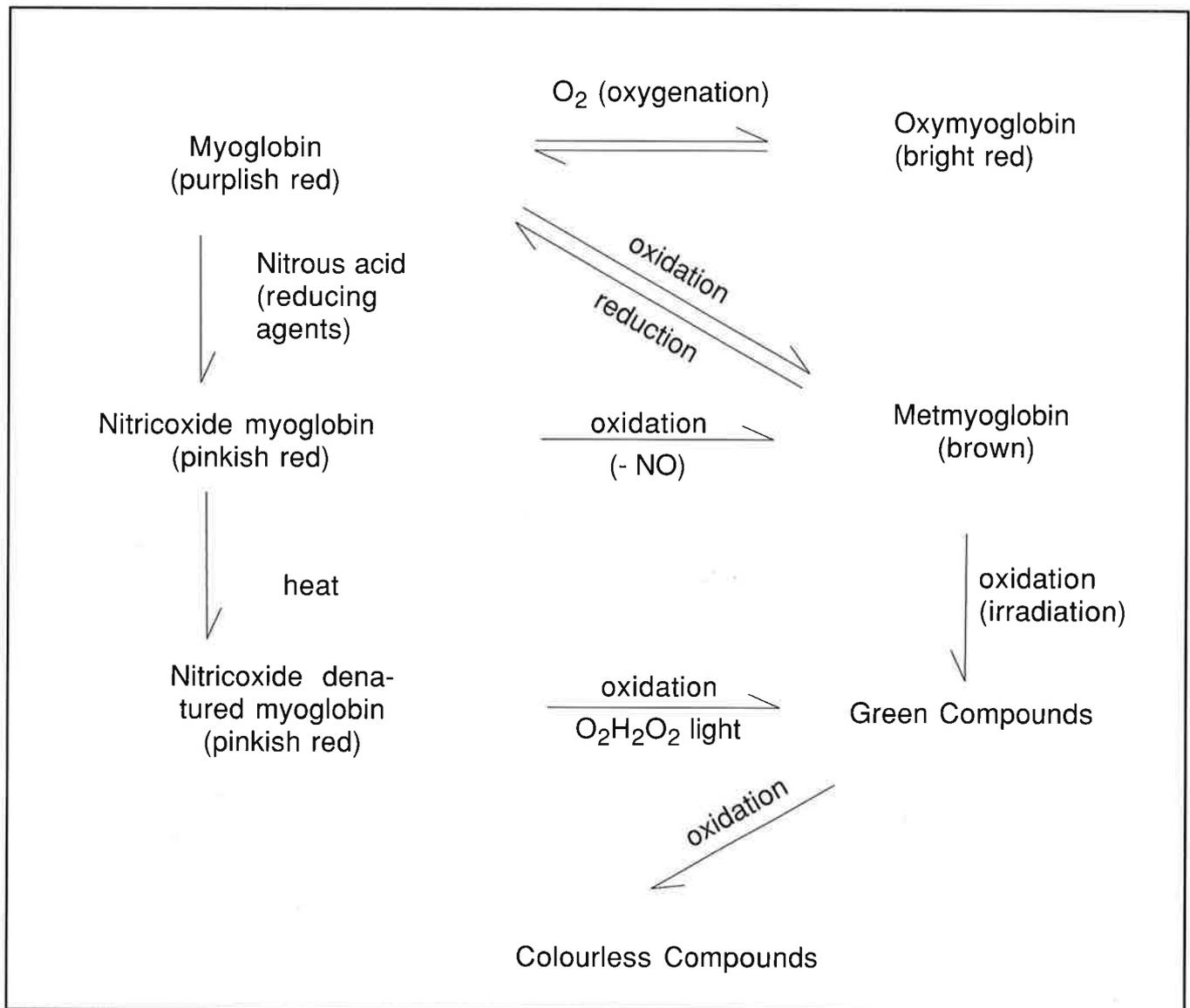
Following further conditioning by drying, boiling or smoking, or combinations thereof, the colour will become lighter or darker.

Nitricoxide-Myoglobin Oxidation

In the presence of air (oxygen), this pigment will undergo oxidation to met-myoglobin.

Contrary to the reactions of fresh meat which are relatively slow, the oxidation of nitricoxide-myoglobin occurs much faster, and is considerably accelerated by the influence of (light) radiation., bacteria, fungi and high temperatures.

The following diagram describes the various reactions which myoglobin can undergo.



Light (Radiation) Absorption by Myoglobin and its Derivatives

Light absorption means the absorption of radiant energy, which will cause photo-chemical change. Myoglobin and its derivatives have absorption peaks as listed below, principally in the yellow part of the

visible spectrum of radiations. It is interesting to see that myoglobin has its absorption peak (preferential absorption of certain wavelength) at the same wavelength as the human eye sensitivity curve.

Name	Colour	Absorption peaks (nm)
Myoglobin	purplish red	555
Oxymyoglobin	bright red	540, 585
Metmyoglobin	brownish red	510, 635
Nitric oxide myoglobin (cured meat pigment)	pinkish red	544, 575
Carbonmonoxy-myoglobin	red	540, 570
Sulfmyoglobin	green	(540) 617-620
Verdomyoglobin	green	615
Biliverdin (bile pigment)	green	392, 640
Hemin chloride	brownish red	512, 640

Why Fluorescent Lamp Colour 175, Natural Super

For the choice of a neutral white colour temperature of 3900 K the fluorescent powder chemistry had to be developed to provide a high colour rendering index, with the lowest possible spectral radiation in the yellow part of the visible spectrum.

Other fluorescent powder combinations such as Cool White, Warm White, etc, emit much higher levels of yellow radiation and give a distorted colour rendering to the meat products. A fluorescent colour such as GRO-LUX which is sometimes used for meat product lighting provides lower levels of yellow radiation, but seriously distorts the colour aspect with a colour rendering index of approximately 6 Ra, and a colour temperature close to 8500 K.

Incandescent lamps, as well as reflector or PAR lamps, tungsten halogen lamps, emit high levels of yellow radiation for the same luminous flux, but also a lot of infrared which increases the temperature of the displayed meat products.

Discharge lamps, like mercury or metal halide lamps radiate high levels of yellow radiation and do not provide the light quality in terms of colour rendering index.

For these reasons, fluorescent lamp colour 175, Natural Super is the best choice for meat product lighting.

How to Maintain the Fresh Appearance of Meat Products

The objective is to avoid the oxidation of the desired pigment forms and the formation of met-myoglobin, for both the appearance of the product and its food value.

Not only (light) radiation but also other factors will influence the rate of degradation, and consequently the possible display and storage time in commercial environments.

General recommendations are listed below.

	Fresh Meat	Processed (cured) Meat Products
Refrigeration	2 - 5°C	2 - 5°C
Packaging Film	Barrier for moisture Permeable for oxygen	Barrier for moisture Impermeable for oxygen
Light transmission of packaging material	No special measure	Low light transmission
Applied illuminance	Up to 500 lux	Up to 300 lux
Environment for processing, packaging.	Low presence of bacteria and fungi. Clean cutting implements and work surfaces. Air: cooling, filtration and treatment with germicidal lamps.	

Light Permeability of Packaging Film

For fresh meat, no special precautions are necessary, good visibility of the product is desirable. Any photochemical change will be slow and under proper (lighting) conditions, there will be little to no change even after days of display.

For cured meat products, on the contrary, packaging film of low light permeability helps extend display life, but conflicts with the requirement for product visibility. The use of printed or aluminium coated film for one side of the packaging is a possible solution.

Recommended Illuminance (lux)

For the recommended fluorescent lamp colour 175 with relatively low emissions in the critical range of wavelengths (510-635 nm), we would apply the following illuminance.

These recommendations are made for an average shelf life under refrigerated conditions, and suitable packaging.

Fresh meat, poultry	300-500 lux
Processed, cured meat products	200-300 lux

General Recommendations

Refrigeration

To slow down any photochemical reaction and to avoid proliferation of bacteria and fungi.

Packaging Film

For both, fresh meat and processed meat products, the film should retain the moisture to avoid drying-out of the surface. This is particularly important for the deep freezing of meat products.

For fresh meat and poultry, good oxygen permeability of the film is desirable to keep the surfaces oxygenated (oxymyoglobin). Otherwise the oxygen will diffuse to the inside of the meat and the displayed surface will change to a bluish red, myoglobin.

For cured meats, the lowest oxygen permeability is required for packaging to avoid oxidation and the formation of metmyoglobin. This type of film in combination with vacuum sealing offers good results.

For the unpackaged display of cured meat product for the individual serving of clients, it is good practice to apply a piece of foil to the freshly cut surface, to maintain colour and freshness.

General Environment

Strict hygienic conditions during processing, cutting and packaging play an important role for storage and display shelf life.

This concerns work places and tools as much as the environment. - Air cooling, air filtering and air treatment for sterilisation should be used to reduce the influence of bacteria and fungi.

Germicidal lamps are used specifically in storage rooms for air sterilisation, and need to be installed with adequate precautions to avoid exposure of personnel to the harmful UVC radiation.

→ See Germicidal Lamps.

Colour 175, Natural Super Lamp Range

Wattage (W)	Type Description	Code Nr.	Std Packing Quantity	Dimensions		Cap	Light Output (lm)	Efficiency (lm/w)
				Ø	L			
15	F15W/T8/175	02157	25	26	437	G13	450	30
18	F18W/175	01810	25	26	590	G13	680	38
30	F30W/T8/175	01971	25	26	895	G13	1090	36
36	F36W/175	01811	25	26	1200	G13	1480	41
58	F58W/175	01812	25	26	1500	G13	2500	42

Lighting for Meat Processing (Cutting, Packaging, Inspection)

Considering the limited exposure time of fresh meats to light in these applications, no special precautions are required for the selection of a light source.

Normal lighting practice is applied with the criteria of

- adequate illuminance (lux)
- lamp efficiency (lm/W)
- colorimetric performance of the lamp regarding colour temperature (K) and colour rendering index (Ra)

It is only for the inspection of meat and poultry, for the recognition of defects caused by injury, disease or contamination, that a narrower range of lamp colours should be chosen to facilitate this work. The recommendations below reflect the results of comparative tests.

	General Processing Cutting, Packaging	Meat and Poultry Inspection
Illuminance	500 (-700) lux	1000 (-1500) lux
Colour Temperature	(3000-) 4000 K	(3000-) 4000 K
Colour Rendering Index	Class 2a - 2b	Class 1a - 1b
Fluorescent Lamp Colours	133, <u>233</u> (125) <u>184</u>	184, <u>194</u>

Note: All data for guidance only. Sylvania reserves the right to alter specifications without notice.

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