



THE SAFETY OF DYES FOLLOWING THE SUDAN RED INCIDENT

從蘇丹紅事件來看染料的安全性



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01	什麼是著色劑？ What are colorants?	02
02	著色劑管理標準的訂定 Establishment of colorant management standards	07
03	什麼是蘇丹紅？ What is Sudan Red?	10
04	蘇丹紅染色原理與危害 Sudan Red Dyeing Principles and Hazards	02
05	蘇丹紅在紡織品的規定 Regulation of Sudan Red in Textiles	02
06	染料禁用芳香胺起源 Origin of Banned Aromatic Amines in Dyes	02
07	染料禁用芳香胺法規 Regulations banning aromatic amines in dyes	02
08	為綠色染料保駕護航 Monitoring Chemicals: Safeguarding Green Dyes	02



WHAT ARE COLORANTS?

什麼是著色劑？

→ CHAPTER

01

什麼是著色劑？

What Are Colorants?

著色劑是一種常見的食品添加物，可分為天然色素和人工合成色素。


目前台灣核准 8 種人工合成色素以及 46 種來源的天然食用色素。8 種人工合成色素，分別為食用藍色 1 號、食用藍色 2 號、食用綠色 3 號、食用黃色 4 號、食用黃色 5 號、食用紅色 6 號、食用紅色 7 號、以及食用紅色 40 號。


Colorants are common food additives that can be categorized into natural colorants and synthetic colorants.


Currently, Taiwan has approved 8 types of synthetic colorants and 46 types of natural food colorants.


Eight types of artificial synthetic colorants are listed, namely FD&C Blue No. 1, FD&C Blue No. 2, FD&C Green No. 3, FD&C Yellow No. 4, FD&C Yellow No. 5, FD&C Red No. 6, FD&C Red No. 7, and FD&C Red No. 40. .


8 種人工合成色素 8 kinds of artificial synthetic colorants


 食用藍色 1 號 FD&C Blue No. 1


 食用黃色 5 號 FD&C Yellow No. 5

 食用藍色 2 號 FD&C Blue No. 2

 食用紅色 6 號 FD&C Red No. 6

 食用綠色 3 號 FD&C Green No. 3

 食用紅色 7 號 FD&C Red No. 7

 食用黃色 4 號 FD&C Yellow No. 4

 食用紅色 40 號 FD&C Red No. 40

人工合成色素是化學合成的著色劑，主要是以石油中分餾出來的原料來進行化學合成來製造，人工合成各樣顏色和色調，比天然化合物更耐熱、更光亮、也更鮮豔，且成本較為低廉。

Synthetic colorants are coloring agents that are chemically synthesized. They are mainly produced through the chemical synthesis of raw materials fractionated from petroleum. Various colors and tones are artificially synthesized. They are more heat-resistant, brighter, and more vivid than natural compounds, and they are also more cost-effective. Relatively inexpensive.

人工食用色素一直以來最為人所質疑的即是安全性問題，目前合法使用的食用色素都是經過長期評估與檢測、衡量風險和助益後，才訂定使用範圍及限量標準，且正常狀況下色素的添加量在原料成分中占比非常低，在合法使用和正常食用下，不會危害健康。

The safety of artificial food colorants has always been a major concern. The food colorants currently used legally have undergone extensive evaluation and testing over a long period. The risks and benefits are carefully assessed before establishing the scope of use and setting limit standards. Under normal circumstances, the food colorants added account for a very low proportion of the raw material ingredients, and they will not harm health when used within legal limits and consumed normally.

一般來說食品業者會基於以下原因添加著色劑：

Generally, food manufacturers add colorants for the following reasons:

01 改善食品色調和色澤以美化食品，來增加商品價值。

To enhance the appearance and appeal of food, making it more visually appealing and increasing its value.

02 維持食品色調和色澤，避免在食品製造、加工或儲存過程中，可能因光線、空氣、溫度、水分、pH 值等影響，使得顏色改變或消失。

Preserve the color and appearance of food to prevent changes or fading caused by light, air, temperature, moisture, pH levels, etc., during food manufacturing, processing, or storage.

03 做為產品辨識用途，亦可確保食用正確性。

For product identification purposes, it can also ensure correct consumption.

04 用於維持食品之營養價值。

Used to maintain the nutritional value of food.

05 防止食品腐敗變質或化學變化。

Prevent food spoilage or chemical changes.

06 其他對消費者有利之原因，如食品膠囊或錠劑中添加食用色素，可提高辨識度確保食用正確性，也可增加遮光性避免內含的萃取物活性因光照而氧化。

Other benefits for consumers include adding food coloring to food capsules or tablets. This can enhance recognition, ensure correct consumption, and increase light shielding to prevent the active extracts from being oxidized by light.

常見的天然食用色素如下：

Common natural food colorants include the following.

葉綠素

Chlorophyll

主要存在於綠色植物的葉，富含鎂離子具有抗氧化的效果。

Chlorophyll is primarily found in the leaves of green plants. It is rich in magnesium ions and has antioxidant effects.

花青素

Anthocyanin

存在植物中的紅色至藍色色素，容易受環境中的酸鹼值影響，具有紅、紫、藍的變化。

Plants contain red to blue pigments that are sensitive to the pH levels in their environment, causing them to shift in color from red to purple or blue.

番茄色素

Tomato Colors

胡蘿蔔系的天然食用水溶性色素，染色與附著力高不會因日照而變色。

Carrot-based natural edible water-soluble pigments have high dyeing and adhesion properties and will not change color when exposed to sunlight.

胭脂紅色素

Carmine

又稱為洋紅酸顏色亮紅鮮豔，是品質優良的純天然色素。耐熱性、耐光性及安定性佳。在酸性下呈現粉紅色，而鹼性下則呈紫紅色。

Also known as magenta acid, this colorant has a bright red hue and is a high-quality, pure natural dye. Good heat resistance, light resistance, and stability. It appears pink under acidic conditions and purple-red under alkaline conditions.

黃梔子色素

Gardenia Yellow

由黃梔子中提製出來的色素，為水溶性亮黃的類胡蘿蔔素色素，染著性佳，穩定性高。添加維生素 C 可提高酸性下的耐光性，鐵、銅金屬離子存在時會變色，漂白粉、過氧化氫存在時會有退色的現象。

The colorant extracted from gardenia is a water-soluble bright yellow carotenoid.

With excellent dyeing properties and high stability. Adding vitamin C can enhance light resistance in acidic conditions. It will change color in the presence of iron and copper metal ions, and it will fade in the presence of bleaching powder and hydrogen peroxide.

紅甜菜色素

Beet Red

由甜菜根提煉而出，製品可分三種，液態濃縮液、脫水甜菜粉及噴霧乾燥甜菜紅色素。PH 值會影響其安定性，對熱、氧氣及光線很敏感。

Extracted from beetroot, the products can be divided into three types: liquid concentrate, dehydrated beet powder, and spray-dried beet red colorant. The pH value will affect the stability of the product, and it is highly sensitive to heat, oxygen, and light.

胡蘿蔔素

Carotene

由胡蘿蔔之根莖取得，主成分為胡蘿蔔素。

天然橘紅色，其著色為美麗的淡黃色至橙色。方便使用安定性佳，有強化營養的效果，可於各類食品中適量使用。

It is obtained from the rhizome of a carrot, and its main component is β -carotene.

Natural orange-red, its color ranges from a beautiful pale yellow to orange. It is easy to use, offers good stability, and enhances the nutritional value. It can be used in appropriate amounts in various foods.

葉綠素色素

Chlorophyll Colors

由薑黃色素和梔子藍色色素混合而成，分有油性和水性兩種。對光、熱安定，分散性良好，著色色澤呈現美麗的黃綠至深綠色。

It is made from a mixture of curcumin and gardenia blue colorant and is available in two types: oil-based and water-based. It is stable to light and heat, has good dispersibility, and its coloring displays a beautiful range from yellow-green to dark green.

紅麴色素

Monascus Colors

從紅麴菌中培養出的赤色色素，色澤為暗紅到成紅。PH 值 3-10 最佳，不因 PH 值改變而變色，耐熱性亦佳。

The red colorant extracted from red yeast rice has a deep red hue. The optimal pH range is 3-10. It will not change color due to changes in pH value and has good heat resistance.



ESTABLISHMENT OF COLORANT MANAGEMENT STANDARDS

著色劑管理標準的訂定

→ CHAPTER

02

著色劑管理標準的訂定

Establishment of colorant management standards

針對食品著色劑的管理，台灣與歐盟、美國一樣，在經過完整的科學安全評估，確保沒有安全疑慮後，才核准使用在食品中。

In terms of food colorant regulation, Taiwan, like the European Union and the United States, only approves the use of food colorants after a comprehensive scientific safety assessment to ensure the absence of safety concerns.

常見的違法添加著色劑可區分為四大類型：

Common illegally added colorants can be divided into four major types:

非法添加

Illegal addition

2014 年毒台灣豆干事件，即因為在豆乾、豆腐等豆製品中被檢出含有工業染料二甲基黃、二乙基黃，因具有致癌性，禁用於食品中，屬於非法添加。

2017 年 7 月所發生的，鹹蛋黃驗出致癌「蘇丹紅」食安事件，以及 2024 年年初的含有蘇丹紅的辣椒粉風波，都是非法添加致癌「蘇丹紅」。(備註)

In the 2014 Taiwanese dried tofu incident, industrial dyes dimethyl yellow and diethyl yellow were detected in dried tofu, tofu, and other soy products. Due to their carcinogenic nature, these substances are banned from being used in food and are considered illegal additives.

The food safety incident in July 2017, where salted egg yolks were found to contain the carcinogenic "Sudan red," and the scandal involving chili powder containing Sudan red in early 2024, both involved illegal additions of the carcinogenic "Sudan red." (Remark)

標示不實

False Labeling

標示不實是常見的違法狀況，如在 2018 年台北市抽驗中秋應節食品，即檢出綠豆碰含有食用色素紅色 6 號、食用色素紅色 40 號，但外包裝成分僅標示食用色素 40 號。

False labeling is a common illegal practice. For example, during Taipei City's 2018 Mid-Autumn Festival food sampling, mung beans were found to contain FD&C Red No. 6 and FD&C Red No. 40, but the outer packaging only listed FD&C No. 40 in the ingredients.

超標使用

Excessive Use

在 2015 年台灣食藥署抽驗年節食品，即有 3% 的商品食品添加物超過標準。

In 2015, the Taiwan Food and Drug Administration conducted random inspections on New Year's Eve foods and found that 3% of commercial food additives exceeded standards.

法規不同

Regulations vary

2018 年某知名品牌馬卡龍被驗出非法色素「紅色 3 號色素」，紅色 3 號色素是歐盟認可的合法添加物，但未並列入台灣核准使用的添加物表列中，因此進口台灣就會變成非法添加。

In 2018, a popular brand of macarons was found to contain the illegal coloring "Red No. 3". Red No. 3 is a legal additive recognized by the EU, but it is not included in Taiwan's list of approved additives, so it cannot be imported into Taiwan. It will become illegal to add.

備註：根據台灣環保署化學局公告，包括「蘇丹色素」等 14 種可能非法添加於飼料或食品中的色素，都是工業用色素染料，不可用於食品中，已列為第四類毒性化學物質。

蘇丹色素等的 14 種物質，分別為「蘇丹 1 號、蘇丹 2 號、蘇丹 3 號、蘇丹 4 號、蘇丹紅 G、蘇丹橙 G、蘇丹黑 B、蘇丹紅 7B、二乙基黃、王金黃（塊黃）、鹽基性芥黃、紅色 2 號、氮紅、橘色 2 號」。

According to the announcement from the Chemistry Administration of the Ministry of Environment in Taiwan, fourteen types of pigments that could potentially be unlawfully added to feed or food, such as "Sudanese pigments," are all industrial pigments and dyes that are not permitted for use in food. They have been classified as Category IV toxic chemicals. Substance.



WHAT IS SUDAN RED?

什麼是蘇丹紅？

→ CHAPTER

03

什麼是蘇丹紅？

What is Sudan Red?

蘇丹紅是一系列的人工合成溶劑型紅色工業染料，其中的成分包含染色油料、油脂類、蠟和塑膠。其特性是可溶於脂肪和油類，但並不溶於水。常見的蘇丹紅色素包括蘇丹紅一號、二號、三號和四號等數種紅色染料。

作為工業用染料，由於成本低廉、不易退色，所以自 1896 年被命名後就不斷使用至今。蘇丹紅在工業上，大量地使用於溶劑、汽油、皮革、地板，甚至是煙火等上，作為增色用途。另外也運用在化學與生技等領域中。

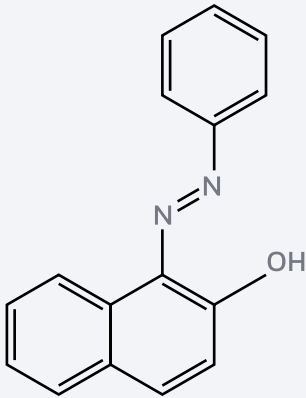
Sudan Red is a group of synthetic solvent-based red industrial dyes used for dyeing oils, greases, waxes, and plastics. It is characterized by its solubility in fats and oils but insolubility in water. Common Sudan red colorants include several red dyes such as Sudan Red I, Sudan Red II, Sudan Red III and Sudan Red VI.

As an industrial dye, it has been used consistently since its introduction in 1896 due to its affordability and resistance to fading. In industry, Sudan Red is widely used in solvents, gasoline, leather, flooring, and even fireworks as a color enhancer. It is also used in fields such as chemistry and biotechnology.



蘇丹紅一號

Sudan Red I



蘇丹紅一號是一種合成偶氮染色劑，顏色呈現鮮紅色。在工業應用中稱為溶劑黃 14 或油溶黃 R。國際癌症研究機構表明，蘇丹紅一號被列入第三類致癌物，屬於三級致癌物質。

而台灣環境部化學物質管理署將蘇丹紅 1 號列為「第四類毒性化學物質」意指該化學物質對環境污染和人體健康有危害性。

Sudan Red I is a synthetic azo dye that appears bright red in color. In industrial applications, it is called Solvent Yellow 14 or Oil-Soluble Yellow R.

According to the International Agency for Research on Cancer, Sudan I is classified as a Category III carcinogen and is a Level 3 carcinogen.

The Chemicals Administration, Ministry of Environment of Taiwan's classifies Sudan Red 1 as a "Category IV Toxic Chemical Substance," indicating that this chemical is detrimental to environmental pollution and human health.

中文化學名稱	1- 苯基偶氮 -2- 萘酚
English chemical name	1-phenylazo-2-naphthol
別名 Alias	蘇丹一號 Sudan I、Solvent Yellow 14
分子式 Molecular formula	C ₁₆ H ₁₂ N ₂ O
分子量 Molecular Mass	248.28
CAS No.	842-07-9

蘇丹紅一號毒性 Sudan Red I Toxicity

潛伏致癌性

Potential Carcinogenicity

可能引起皮膚過敏

May cause skin allergies

可能對環境有負面影響

May have a negative impact on the environment

感染其毒性有不可逆的影響

Infections that have irreversible toxic effects

染色應用 Dyeing Applications

具有鮮豔的紅橙色

With a bright reddish-orange color

對於油、蠟和塑料著色效果優良

Excellent for coloring oils, waxes, and plastics

可以染色在富含脂質的組織

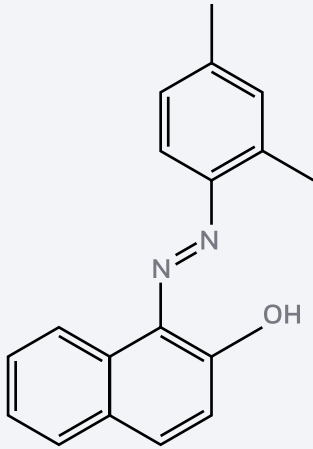
Can stain lipid-rich tissues

蘇丹紅一號容易影響肝臟器官，導致癌症發生，額外會引起膀胱、脾臟等臟器官的腫瘤。

Sudan Red I can easily affect the liver and cause cancer. It can also cause tumors in the bladder, spleen, and other organs.

蘇丹紅二號

Sudan Red II



蘇丹紅二號也稱為蘇丹二號、是一種脂肪偶氮染色劑，外觀呈現紅色粉狀物，常用於凍結切片的三酸甘油酯的染色。在工業應用上則針對油、蠟等不容易上色的物質進行上色。

Sudan Red II, also known as Sudan II, is a fatty azo stain with a red powdery appearance and is often used to stain triglycerides in frozen sections. In industrial applications, it is used to color substances like oils and waxes that are challenging to color.

中文化學名稱	1-[(2,4- 二甲基苯) 偶氮]-2- 萘酚
English chemical name	1-[(2,4-dimethylphenyl)azo]-2-naphthalenol
別名 Alias	Solvent Orange 7, C.I. Solvent Orange 7
分子式 Molecular formula	C ₁₈ H ₁₆ N ₂ O
分子量 Molecular Mass	276.33
C.I.	12140
CAS No.	3118-97-6

蘇丹紅二號毒性 Sudan Red II Toxicity

潛伏致癌性

Potential Carcinogenicity

可能引起皮膚過敏

May cause skin allergies

染色應用 Dyeing Applications

具有鮮豔的紅色

With a bright red color

對於油、蠟和塑料著色效果優良不溶於水

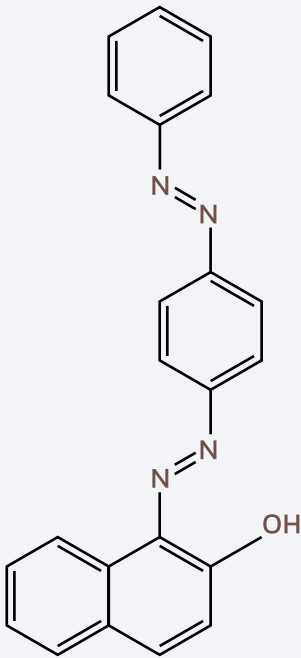
Insoluble in water

針對不易上色的物質上色

Coloring materials that are hard to color

蘇丹紅三號

Sudan Red III



蘇丹紅三號也稱為蘇丹三號，外型為現紅褐色結晶。常用於凍結切片的三酸甘油脂的染色，工業上則常用於油、蠟等非極性物質的染色。優點是易於溶於脂肪和油質。經國際癌症研究機構調查，確定蘇丹紅三號具有致癌物質，屬於三級致癌物質。

Sudan Red III, also known as Sudan III, has a reddish-brown crystalline appearance. It is often used for staining triglycerides in frozen sections. Industrially, it is commonly used for staining non-polar substances like oils and waxes.

The advantage is that it is easily soluble in fats and oils. An investigation by the International Agency for Research on Cancer has found that Sudan Red III contains carcinogens and is classified as a Class III carcinogen.

中文化學名稱	1-[[4-(苯基偶氮) 苯基] 偶氮]-2- 萘酚
English chemical name	1-[[4-(phenylazo)phenyl]azo]-2-naphthalenol
別名 Alias	Sudan Red BK, Fat Ponceau G, Cerasin Red, Solvent Red 23
分子式 Molecular formula	C ₂₂ H ₁₆ N ₄ O
分子量 Molecular Mass	352.39
C.I.	26100
CAS No.	85-86-9

蘇丹紅三號毒性 Sudan Red III Toxicity

潛伏致癌性

Potential Carcinogenicity

可能引起皮膚過敏

May cause skin allergies

染色應用 Dyeing Applications

可溶於脂肪、油和乙醇

Soluble in fats, oils, and ethanol

顏色是鮮紅色

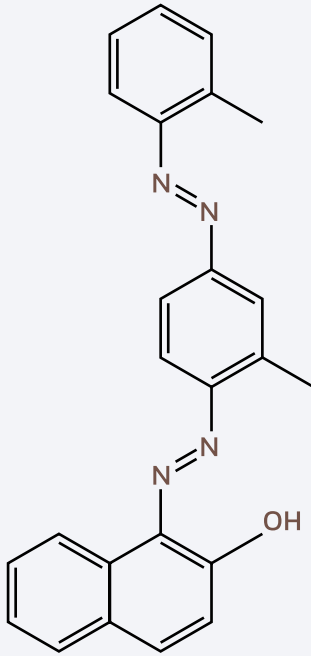
The color is bright red

用於科學應用和顯微鏡檢查工具

For scientific applications and microscopy tools

蘇丹紅四號

Sudan Red IV



蘇丹紅四號也稱為蘇丹四號是一種偶氮染色劑。常用來在冰凍石蠟切片上的脂肪和脂蛋白染色的方式。經國際癌研究機構調查，確定蘇丹紅四號具有致癌物質，屬於三級致癌物質。

Sudan Red IV also known as Sudan IV is an azo dye. A commonly used method for staining fat and lipoproteins on frozen paraffin sections. An investigation by the International Agency for Research on Cancer has found that Sudan Red IV contains carcinogens and is classified as a Class III carcinogen.

中文化學名稱	1-{{2- 甲基 -4-[(2- 甲基苯) 偶氮] 苯基 } 偶氮 }-2- 萘酚
English chemical name	1-{{2-methyl-4-[(2-methylphenyl)azo] phenyl}azo]-2-naphthalenol
別名 Alias	Solvent Red 24, Oil Red, Fat Red B, Scarlet Red, Scarlet Red N.F
分子式 Molecular formula	C ₂₄ H ₂₀ N ₄ O
分子量 Molecular Mass	-
C.I.	2610
CAS No.	85-83-6

蘇丹紅四號毒性 Sudan Red IV Toxicity

潛伏致癌性

Potential Carcinogenicity

可能引起皮膚過敏

May cause skin allergies

染色應用 Dyeing Applications

可溶於脂肪、油和有機溶劑

Soluble in fats, oils, and organic solvents

其他蘇丹色素

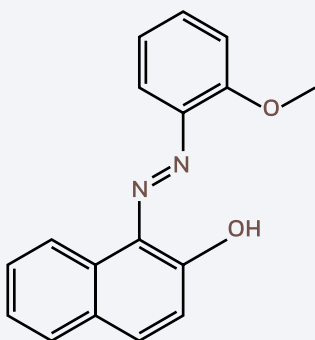
Other types of Sudan colorants

所謂的蘇丹色素有 14 種，除了上述的「蘇丹紅一號、蘇丹紅二號、蘇丹紅三號、蘇丹紅四號」，還包括「蘇丹紅 G、蘇丹橙 G、蘇丹黑 B、蘇丹紅 7B、二乙基黃、王金黃（塊黃）、鹽基性芥黃、紅色 2 號、氮紅、橘色 2 號」

There are 14 types of Sudan colorants. In addition to the above-mentioned "Sudan Red I, Sudan Red II, Sudan Red III, and Sudan Red IV," they also include "Sudan Red G, Sudan Orange G, Sudan Black B, Sudan Red 7B, Diethyl Yellow, Basic Orange 2, Basic Mustard Yellow, Red II, Nitrogen Red and Orange II."

蘇丹紅 G

Sudan Red G



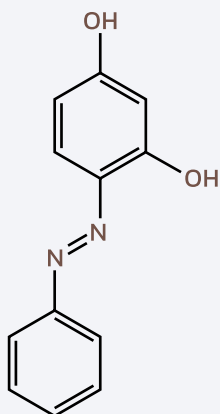
蘇丹紅 G 又稱為溶劑紅 1 (Solvent Red I) 是一種黃紅色的偶氮染料，曾被作為溶劑染料和食用色素，歐洲食品安全局認為其具有基因毒性和致癌性。

Sudan Red G, also known as Solvent Red I, is a yellow-red azo dye that was previously utilized as a solvent dye and food coloring. The European Food Safety Authority considers it genotoxic and carcinogenic.

中文化學名稱	1-[(2- 甲氧基苯基) 偶氮]-2- 萘酚
English chemical name	1-[(E)-(2-methoxyphenyl) diazenyl] naphthalen-2-ol
別名 Alias	Solvent Red I
分子式 Molecular formula	C ₁₇ H ₁₄ N ₂ O ₂
分子量 Molecular Mass	278.28
C.I.	Solvent Red I
CAS No.	1229-55-6

蘇丹橙 G

Sudan Orange G



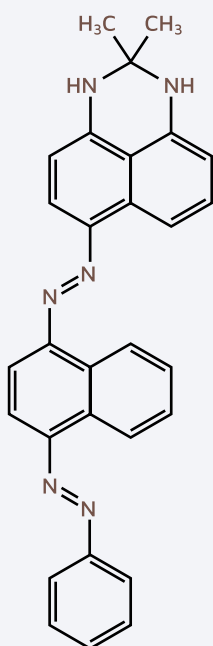
蘇丹橙 G 是一種常見的有機染料，外觀呈現一種深紅色的結晶體，具有良好的溶解度和穩定性。在染料工業中，可用作染色劑來給紡織品、皮革、紙張和塑膠等材料染色。

Sudan Orange G is a common organic dye that appears as dark red crystals with outstanding solubility and stability. In the dye industry, it can be used as a coloring agent for materials such as textiles, leather, paper, and plastics.

中文學名	2,4-二羥基偶氮苯
English chemical name	2,4-Dihydroxyazobenzene
別名 Alias	Solvent Orange I
分子式 Molecular formula	C ₁₂ H ₁₀ N ₂ O ₂
分子量 Molecular Mass	214.22
C.I.	11920
CAS No.	2051-85-6

蘇丹黑 B

Sudan Black



蘇丹黑 B 是一種重氮脂肪染色劑，用於染中性的脂質冰凍切片和一些脂蛋白的石蠟切片。正常情況下為黑褐色或黑色粉末狀。蘇丹黑 B 是蘇丹染料之一，可用來提取指紋以及給成髓細胞染色。

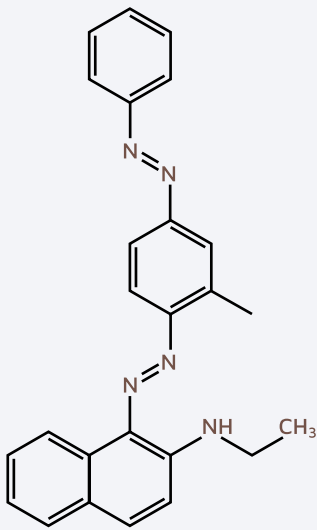
Sudan Black B is a diazo fat stain used to stain neutral lipids in frozen sections and paraffin sections of specific lipoproteins.

Normally, it is dark brown or black powder. Sudan Black B is one of the Sudan dyes that can be used for extracting fingerprints and staining myeloblasts.

中文學名	(2,2-二甲基-1,3-二氫咪啶-6-基)-(4-苯基偶氮-1-萘基)二氮烯
English chemical name	(2,2-dimethyl-1,3-dihydroperimidin-6-yl)-(4-phenylazo-1-naphthyl)diazene
別名 Alias	Fat Black HB, Solvent Black 3
分子式 Molecular formula	C ₂₉ H ₂₄ N ₆
分子量 Molecular Mass	456.54
C.I.	26150
CAS No.	4197-25-5

蘇丹紅 7B

Sudan Red 7B



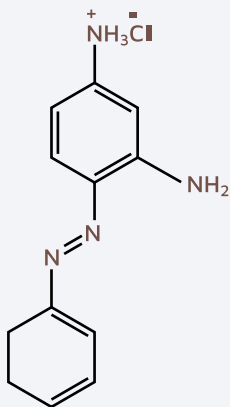
蘇丹紅 7B，是一種有機化合物，2017 年 10 月 27 日，世界衛生組織國際癌症研究機構公佈的致癌物清單初步整理參考，蘇丹紅 7B 在 3 類致癌物清單中。

Sudan Red 7B is an organic compound. On October 27, 2017, the World Health Organization's International Agency for Research on Cancer released a preliminary list of carcinogens for reference. Sudan Red 7B is on the list of Class 3 carcinogens.

English chemical name	N-Ethyl-1-[[4-(phenyldiazenyl)phenyl]diazenyl]naphthalen-2-amine
別名 Alias	Fat Red 7B, Fat red bluish, Solvent Red 19
分子式 Molecular formula	C ₂₄ H ₂₁ N ₅
分子量 Molecular Mass	262.31
C.I.	11285
CAS No.	6368-72-5

王金黃 (塊黃)

Basic orange 2



可溶於水的白色粉末或結晶，生產方式是將苯胺重氮化，然後與間苯二胺偶合，再經溶解、結晶、乾燥而得。人體接觸會產生過敏。

It is a white powder or crystal that is soluble in water. It is produced by diazotizing aniline, coupling it with m-phenylenediamine, and then dissolving, crystallizing, and drying the compound. Human contact may trigger allergies.

English chemical name	4-Phenylazo-m-phenylenediamine monohydrochloride
別名 Alias	Orange red, Crysodine Y, BASIC ORANGE
分子式 Molecular formula	C ₁₂ H ₁₃ ClN ₄
分子量 Molecular Mass	248.71
C.I.	11270
CAS No.	532-82-1

二乙基黃 / 二甲基黃

Dimethyl yellow

二乙基黃 (dimethyl yellow) 本身為鹼性，早期被當作酸鹼測試劑、工業油性染色劑，變色範圍為 pH 值 2.9 至 4.0，長期攝取會增加罹患肝癌、肺癌、膀胱癌和接觸性皮膚癌的風險，因此被國際癌症研究署 (IARC) 列為 2B 等級的致癌物，不能使用於人體，亦即禁止用作食物染劑。

Dimethyl yellow itself is alkaline. It was used as an acid-base test agent and industrial oil dye in the early days. The discoloration range is pH 2.9 to 4.0. Long-term ingestion can increase the risk of liver cancer, lung cancer, bladder cancer, and contact-related diseases. Due to the risk of skin cancer, it is classified as a Level 2B carcinogen by the International Agency for Research on Cancer (IARC) and cannot be used in humans. Therefore, it is prohibited to be used as a food dye.

中文化學名稱	N,N- 二甲基 -4-(苯偶氮基) 苯胺
English chemical name	N,N-dimethyl-4-(phenyldiazenyl) benzenamine
別名 Alias	Butter Yellow, Solvent Yellow 2
分子式 Molecular formula	C ₁₄ H ₁₅ N ₃
分子量 Molecular Mass	225.28
C.I.	11020
CAS No.	147-14-8

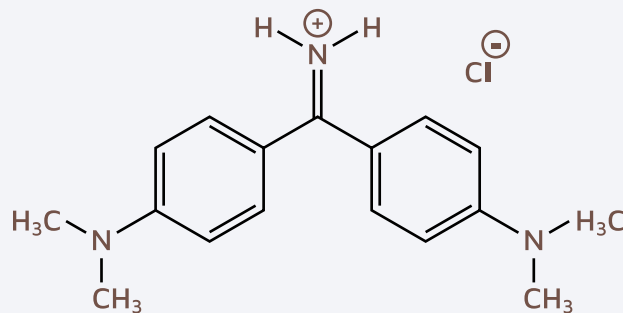
鹽基性芥黃

Auramine O

工業用之化工染料，主要用於紙張、紡織品、皮革之黃色染料，曾有業者添加於糖果、黃蘿蔔、酸菜類等食品。此產品經環保署 107.06.28 公告列管第四類毒化物，列管編號 19001，管制濃度 1%。

Chemical dyes for industrial use are primarily utilized as yellow dyes for paper, textiles, and leather. Some industries have added them to foods such as candies, yellow radishes, and sauerkraut. This product was announced by the Environmental Protection Agency on 107.06.28 to be listed as a Category IV poisonous substance, with a control number of 19001 and a controlled concentration of 1%.

中文化學名稱	4'- 碳酸醯亞胺基雙 (n , n- 二甲基苯胺) 單鹽酸鹽
English chemical name	bis[4-(dimethylamino)phenyl] methaniminium chloride
別名 Alias	Basic yellow 2, Pyocatanium aureum, aizen auramine, Pyoktanin Yellow, Canary Yellow, Pyoktanin
分子式 Molecular formula	C ₁₇ H ₂₂ ClN
分子量 Molecular Mass	303.83
C.I.	41000
CAS No.	2465-27-2



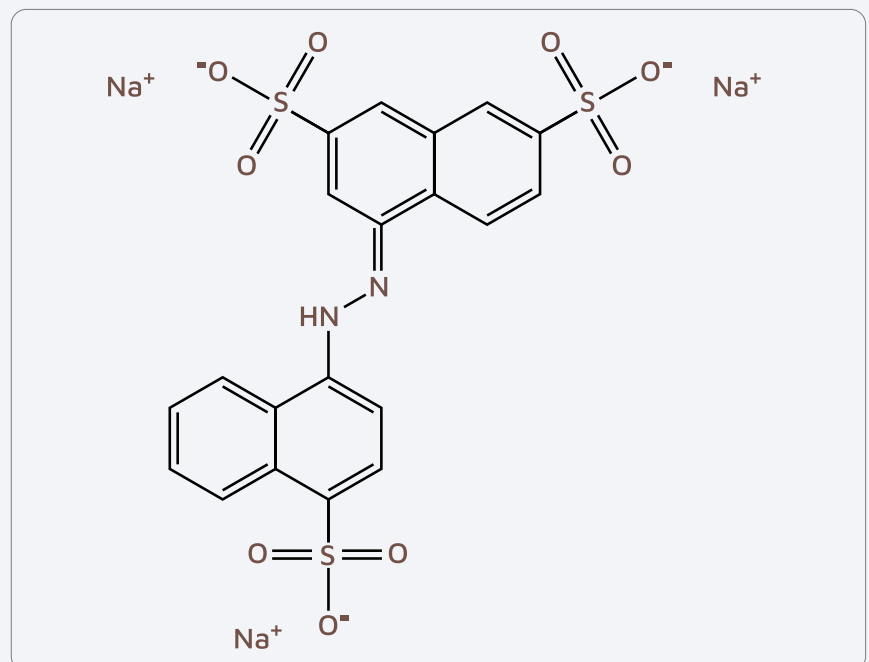
紅色 2 號

Red No.2

工業應用包括羊毛、絲綢、皮革及木材之染色、著色紙塗層及照片著色。曾有業者添加於糖果、餅乾、蜜餞。環保署 107.06.28 公告列管第四類毒化物，列管編號 19101，管制濃度 1%。

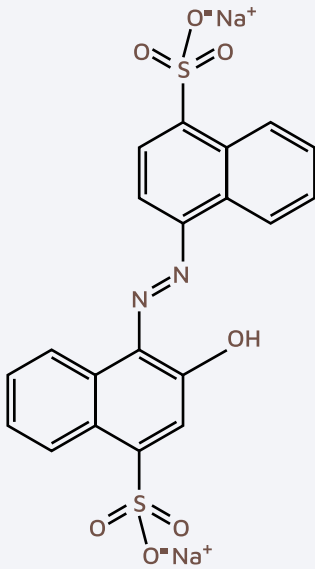
Industrial applications include dyeing wool, silk, leather, and wood, coating colored papers, and coloring photographs. Some people once added it to candies, biscuits, and preserves. The Environmental Protection Agency announced on 107.06.28 that the fourth category of toxic chemicals has been added to the controlled substances list. It is assigned control number 19101 and has a maximum allowable concentration of 1%.

English chemical name	Trisodium (4E)-3-oxo-4-[(4-sulfonate-1-naphthyl)hydrazono]naphthalene-2,7-disulfonate
別名 Alias	FD&C Red No. 2, E123, C.I. Food Red 9, Acid Red 27, Azorubin S
分子式 Molecular formula	C ₂₀ H ₁₁ N ₂ Na ₃ O ₁₀ S ₃
分子量 Molecular Mass	604.47
C.I.	16185
CAS No.	915-67-3



氮紅 (偶氮玉紅)

Azorubine



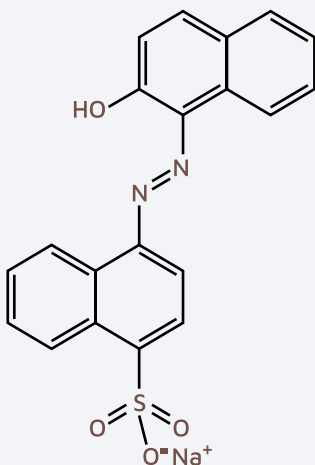
是一種偶氮染料，通過化學合成作為二鈉鹽產生。在其乾燥狀態下，呈現紅色至栗色。其主要用於主要用於發酵後進行熱處理的食品中。環保署 107.06.28 公告列管第四類毒化物，列管編號 19201，管制濃度 1%。

Azo dye is produced through chemical synthesis as a disodium salt. In its dry state, it appears red to maroon in color. It is mainly used in foods that undergo heat treatment after fermentation. The Environmental Protection Agency announced on 107.06.28 that the fourth category of toxic chemicals has been listed with control number 19201, and the regulated concentration is 1%.

English chemical name	disodium 4-hydroxy-2-[(E)-(4-sulfonato-1-naphthyl)diazenyl]naphthalene-1-sulfonate
別名 Alias	Carmoisine, Food Red 3, Brilliantcarmoisin O, Acid Red 14
分子式 Molecular formula	C ₂₀ H ₁₂ N ₂ Na ₂ O ₇ S ₂
分子量 Molecular Mass	502.43
C.I.	14720
CAS No.	3567-69-9

橘色 2 號

Orange II



主要應用於非食品相關之傳統金銀紙之印刷、貼印加工使用。環保署 107.06.28 公告列管第四類毒化物，列管編號 19301，管制濃度 1%。

It is mainly used for printing and sticker processing of non-food-related traditional gold and silver paper. The Environmental Protection Agency announced on 107.06.28 that the fourth category of toxic chemicals has been listed with control number 19301, and the regulated concentration is 1%.

English chemical name	sodium;3-[(2-hydroxynaphthalen-1-yl)diazenyl]benzenesulfonate
別名 Alias	Acid orange 7
分子式 Molecular formula	C ₁₆ H ₁₁ N ₂ NaO ₄ S
分子量 Molecular Mass	350.3
C.I.	633-96-5
CAS No.	3567-69-9



SUDAN RED DYEING PRINCIPLES AND HAZARDS

蘇丹紅染色原理與危害

→ CHAPTER

04

蘇丹紅染色原理與危害

Sudan Red Dyeing Principles and Hazards

蘇丹紅應用於生物研究，目的是使脂質更明顯。蘇丹紅染色原理是基於染料在脂肪物質中的溶解度高於溶劑的特性。當蘇丹紅和含有脂肪的物質接觸時，染色體會大量進入脂肪內部，使得這些脂肪結構變成明顯的紅色。

根據研究顯示，蘇丹紅的化學結構使其在人體內，可能會產生有害反應，如造成肝臟與其他器官的損傷，甚至被懷疑具有致癌性，因此在食品中的使用被嚴格禁止。

Sudan Red Dyeing Principle: Sudan Red is used in biological research to make lipids more visible. The principle of Sudan red dyeing is based on the fact that the solubility of the dye in fatty substances is higher than that in solvents. When Sudan Red comes into contact with fat-containing substances, a large number of chromosomes will enter the fat, causing these fat structures to turn a distinct red color.

According to research, the chemical structure of Sudan Red may cause harmful reactions in the human body, such as damaging the liver and other organs. It is even suspected of being carcinogenic, so its use in food is strictly prohibited.

六大蘇丹紅危害性

Six Dangers of Sudan Red

毒性

Toxicity

人體接觸高濃度的蘇丹紅染料可能會中毒，儘管不同類型的蘇丹紅染料毒性有所不同，但果大量攝入後都會有不良的健康風險。

Humans may be poisoned when exposed to high concentrations of Sudan Red dye. Although different types of Sudan red dye have varying levels of toxicity, they all pose health risks if ingested in large amounts.

致癌性

Carcinogenicity

專家透過動物研究發現部分蘇丹紅類型具有致癌性，且蘇丹紅的代謝物體會與DNA相互作用，導致突變和癌症可能。例如，蘇丹一號被列為可能致癌物。

Experts have found through animal studies that some types of Sudan Red are carcinogenic. The metabolites of Sudan Red can interact with DNA, leading to mutations and the potential risk of cancer. Sudan 1, for example, is classified as a possible carcinogen.

過敏反應

Allergic Reaction

和許多合成化學物質一樣，蘇丹紅也具有過敏反應的風險，而這些過敏反應的嚴重程度從輕微的皮膚刺激到接觸後更嚴重疼痛都有。

Like many synthetic chemicals, Sudan carries a risk of allergic reactions, which can range in severity from mild skin irritation to more severe pain upon contact.

器官損傷

Organ Damage

如果是長期接觸高濃度蘇丹紅的人，可能會造成器官損傷，包括肝臟和腎臟的損傷。蘇丹紅的代謝物可能會在肝臟和腎臟累積並造成一定程度的傷害。

If people are exposed to high concentrations of Sudan red for a prolonged period, it may cause organ damage, including harm to the liver and kidneys. Sudan red metabolites may accumulate in the liver and kidneys, potentially causing some harm.

生育影響

Fertility Effects

蘇丹紅對發育和生育有潛在的危害，但現今具體證據不足，未來需要更多的研究來充分解釋這些風險。

Sudan Red has the potential to harm development and fertility, but there is currently insufficient concrete evidence. More research is needed in the future to fully explain these risks.

環境影響

Environmental Impact

除了對人體健康造成影響外，蘇丹紅的使用不當可能會導致水源污染，影響水裡生物和食物鏈。

Improper use of Sudan red can not only impact human health but also lead to water pollution, affecting aquatic organisms and disrupting the food chain.

各地因添加蘇丹紅所造成的 食品安全危機事件

The food safety crises caused by the addition of Sudan red in various places

2003

法國從進口的辣椒粉中，發現了蘇丹紅的存在，這是第一次被從食品中發現。在向歐盟成員國發出警告後，接連兩年間陸續有成員國，在進口辣椒粉產品中發現蘇丹紅的存在。

The presence of Sudan Red was discovered in paprika imported from France. This is the first time it has been found in food. After issuing a warning to EU member states, some countries have discovered the presence of Sudan Red in imported paprika products over the past two years.

2005

中國發現辣椒醬、醬菜等食品中出現蘇丹紅。同年，中國的肯德基調味料中也被發現含有蘇丹紅。

Sudan Red has been found in chili sauce, pickles, and other foods in China. In the same year, Sudanese red dye was also found in KFC seasoning in China.

2006

中國出現添加蘇丹紅的紅心鴨蛋。

Red duck eggs with Sudan Red dye are being sold in China.

2015

2015年7月，在法國發現了來自印度，含有蘇丹紅I污染的產品，之後，英國食品標準局 (FSA) 陸續發現更多可能受污染的食品，包括香蒜青醬到咖哩雞肉料理等超過了 250 種。因此英國食品標準局 (FSA) 決定針對含蘇丹紅的產品，包括棕櫚油、辣椒粉以及咖喱粉，進行了大規模召回行動。

基於健康風險的考量，歐盟、美國、台灣以及其他許多國家，都禁止在食品中使用蘇丹紅染料。儘管如此在商業利益的驅使下，歷史上蘇丹紅被不法廠商，用於食品中的案件也層出不窮。

Due to health risks, the European Union, the United States, Taiwan, and many other countries have banned the use of Sudan red dye in food. Despite this, driven by commercial interests, there have been numerous cases in history where unscrupulous manufacturers used Sudan red in food. We use the table below to review the food safety crises caused by the addition of Sudan red in various locations.

2015

In July 2015, products from India containing Sudan Red I contamination were discovered in France. After that, the British Food Standards Agency (FSA) successively discovered more potentially contaminated foods, including pesto, curry, chicken dishes, and more. There are 250 species. Therefore, the British Food Standards Agency (FSA) decided to launch a large-scale recall of products containing Sudan red, including palm oil, chili powder, and curry powder.

2017

台灣蛋鴨業者為了使鴨蛋蛋黃色澤更為艷紅，添加蘇丹紅染料 4 號，導致當時雲林 2 禽場、總計 7,100 隻蛋鴨全數撲殺。

In order to enhance the yellow color of duck eggs to a more reddish hue, Taiwan's egg-laying duck industry introduced Sudan Red Dye IV. This decision resulted in the culling of 7,100 egg-laying ducks across two poultry farms in Yunlin at that time.

2024

2024 年年初，食藥署抽驗自中國進口之辣椒粉，並驗出其中添加蘇丹紅。該批原料已流入不同廠商，蘇丹紅的辣椒粉風波開始延燒至今。

In early 2024, the Food and Drug Administration conducted random inspections on chili powder imported from China and found that Sudan red dye had been added to it. This batch of raw materials has been distributed to various manufacturers, and the scandal involving Sudanese red chili powder continues to unfold to this day.

A decorative graphic consisting of a light green bell curve shape positioned in the lower right quadrant of the page. The background is a solid dark green color with a vertical light green bar on the left side.

REGULATION OF SUDAN RED IN TEXTILES

蘇丹紅在紡織品的規定

→ CHAPTER

05

蘇丹紅在紡織品的規定

Regulation of Sudan Red in Textiles



Bluesign

蘇丹紅 I (C.I. Solvent Yellow 14) , 蘇丹紅 II (C.I. Solvent Orange 7) , 蘇丹紅 III (C.I. Solvent Red 23) , 蘇丹紅 IV (C.I. Solvent Red 24) 為不必要還原裂解 就會致癌的禁用染料 , 在 bluesign 規範的第 24 頁與第 79 頁。

Sudan Red I (C.I. Solvent Yellow 14), Sudan Red II (C.I. Solvent Orange 7), Sudan Red III (C.I. Solvent Red 23), Sudan Red IV (C.I. Solvent Red 24) are not necessary for reduction and lysis. Banned dyes that can cause cancer are listed on pages 24 and 79 of the bluesign specification.



Oeko-Tex Standard 100

蘇丹紅 I (C.I. Solvent Yellow 14) 為禁用致癌染料 , 在 Oeko-Tex Standard 100 規範的第 59 頁 , 請看附件 OTS100Standard_02.2023_英文版

Sudan Red I (C.I. Solvent Yellow 14) is a banned carcinogenic dye. For more information, please refer to page 59 of the Oeko-Tex Standard 100 specification.



ZDHC

蘇丹紅 I (Solvent Yellow 14) 為禁用致癌染料 , 在 ZDHC 規範的第 54 頁。

ZDHC regulations state that Sudan Red I (Solvent Yellow 14) is a banned carcinogenic dye. It is on page 54 of the ZDHC specification.

在紡織品的規範中，使用的檢驗方法為 DIN 54231，使用的儀器為液相串聯質譜儀 (LC-MS)

蘇丹紅 II (C.I. Solvent Orange 7)，還原裂解後，會放出致癌芳香胺，2,4- 二甲基苯胺 (2,4-xylylidine)，CAS No. : 95-68-1，IARC 分類是第三類致癌物。

蘇丹紅 III (C.I. Solvent Red 23)，還原裂解後，會放出致癌芳香胺，4- 氨基偶氮苯 (4-aminoazobenzene)，CAS No. 60-09-3，IARC 分類是第二類致癌物。

蘇丹紅 IV (C.I. Solvent Red 24)，還原裂解後，會放出致癌芳香胺，鄰 - 甲苯胺 (o-toluidine)，CAS No. 95-53-4 和 鄰 - 氨基偶氮甲苯 (o-aminoazotoluene)，CAS No. 97-56-3，IARC 分類是第二類致癌物

In the specification of textiles, the inspection method used is DIN 54231, and the instrument used is a liquid phase tandem mass spectrometer (LC-MS) for Sudan Red II (C.I. Solvent Orange 7), after reduction and cleavage, will release the carcinogenic aromatic amine 2,4-dimethylaniline (2,4-xylylidine), CAS No.: 95-68-1. It is classified b IARC as a Category III carcinogen.

Sudan Red III (C.I. Solvent Red 23, after reductive cleavage, will release the carcinogenic aromatic amine 4-aminoazobenzene (4-aminoazobenzene), CAS No. 60-09-3). This compound is classified as a Category II carcinogen.

Sudan Red IV (C.I. Solvent Red 24), after reductive cleavage, releases carcinogenic aromatic amines, o-toluidine (CAS No. 95-53-4) and o-aminoazotoluene (CAS No. 97-56-3). The IARC classification categorizes it as a Category II carcinogen.



分析儀器室 Analytical Instruments Room

國際癌症研究中心將致癌物質分為四大類

The International Agency for Research on Cancer (IARC) divides carcinogens into four major categories.

1 確定為人類致癌物
Determined to be a human carcinogen

足夠的人類流行病學證據，顯示顯示該物質（或混合物）能增加人類罹患腫瘤之機率。

Sufficient human epidemiological evidence indicates that the substance (or mixture) can increase the risk of tumors in humans.

2A 極有可能為人類致癌物
Most likely human carcinogen

無足夠之人類流行病學證據，但有動物試驗結果顯示該物質（或混合物），能增加動物罹患腫瘤之機率。

There is insufficient human epidemiological evidence, but animal test results show that this substance (or mixture) can increase the likelihood of animals developing tumors.

2B 可能為人類致癌物
Possible human carcinogen

無足夠之人類流行病學證據，而動物試驗證據較少。

There is insufficient human epidemiological evidence, and animal testing evidence is sparse.

3 無法歸類為人類致癌物
Not classified as a human carcinogen

人類流行病學證據及動物試驗結果均欠缺。

No human epidemiological evidence and animal testing results.



ORIGIN OF BANNED AROMATIC AMINES IN DYES

染料禁用芳香胺起源

→ CHAPTER

06

染料禁用芳香胺起源

Origin of Banned Aromatic Amines in Dyes

1895

瑞士醫師 Rehn 首先發現，歐洲染料工人罹患膀胱癌的比例很高，在往後的數十年間，陸續有許多國家發現，從事染料及相關行業的工人，成為罹患尿路上皮癌 (Urothelial carcinoma) 的高風險群。經過了長年的研究目前可得知，癌症的形成來自於長時間接觸化學物質聯苯胺及乙萘胺。

In 1895, Swiss physician Rehn first discovered that European dye workers had a high rate of bladder cancer. In the following decades, many countries have discovered that workers in the dye and related industries have become a high-risk group for developing urothelial carcinoma. After years of research, it is now known that cancer formation is linked to prolonged exposure to the chemicals benzidine and ethenylamine.

1958

「MAK 委員會」(Maximale Arbeitsplatz-konzentration)，每年出版的「MAK 表」專門規範已知對人體健康構成危害的化學物質，以及在工作場所空氣中最大的允許濃度。起初是基於自願基礎上，大家所共同遵守的規定，以後就被推薦成為了法令。

In 1958, the "MAK Committee" (Maximale Arbeitsplatzkonzentration) established the "MAK Table," which is published annually. This table specifically regulates chemical substances that are known to be hazardous to human health and sets the maximum allowable concentrations in workplace air. At first, it was a voluntary for everyone, but later it was suggested that it be made into a law.

1971

德國染料工業，因為使用聯苯胺 (Benzidine) 中間體生產染料的工廠工人，接連被發現罹患膀胱癌的比例很高，因此停止了含有聯苯胺 (Benzidine) 的染料生產，之後陸續有更多的苯胺系列染料因為毒性問題被列入「MAK 表」內。

In 1971, the German dye industry ceased production of dyes containing benzidine due to a high incidence of bladder cancer among factory workers who were exposed to benzidine intermediates in dye manufacturing. The aniline series of dyes is included in the "MAK list" due to concerns about toxicity.

1967

英國致癌物管理條例，禁止製造與使用乙萘胺、聯苯胺、4-氨基聯苯、雙氯聯苯胺、鄰聯甲苯胺和以及聯大茴香胺。1974年美國職業安全與保健管理局 (OSHA)，更指名14種有機物化合物為致癌物，其中包括上述的6種，再加上4-二甲氨基偶氮苯，這7種芳香胺都是染料中間體。在日本也有類似的法規限制。隨著芳香胺與重金屬對人體的危害逐漸被重視，因此研究染料毒性以及對生態影響的機構紛紛成立，包括1970年成立的「美國染料製造廠協會」(ADMI; American Dye Manufacturers Institut)、1974年成立的「染料和有機顏料製造商生態和毒理學協會」(ETAD; The Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers)等，都在針對染料以及助劑進行深入研究，以便瞭解其對於健康和環境的影響，進而訂定安全的化學物質與重金屬的含量規範。

The British Carcinogen Management Regulations of 1967 prohibit the manufacture and use of ethyl naphthylamine, benzidine, 4-aminobiphenyl, dichlorobenzidine, o-toluidine, and dianisidine. In 1974, the U.S. Occupational Safety and Health Administration (OSHA) identified 14 organic compounds as carcinogens, which included the 6 previously mentioned compounds, as well as 4-dimethylaminoazobenzene. These seven aromatic amines are all dyes. Intermediate. There are similar regulatory restrictions in Japan.

As the harmful effects of aromatic amines and heavy metals on the human body have gradually been taken seriously, institutions studying the toxicity and ecological impact of dyes have been established. These include the "American Dye Manufacturers Institute" (ADMI; American Dye Manufacturers Institut) established in 1970, and The Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers (ETAD; The Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers), which conducts in-depth research on dyes and auxiliaries to understand their impact on health and the environment. Influence, and then establish safe content standards for chemical substances and heavy metals.

1992

4月10日德國政府公佈新法案的規劃稱為「改進德國生理學接觸法案」，將涉及致癌的15種芳香胺禁用。但該法案對於如何實施管制並不明確，直到1994年7月15日，德國政府對於該法案頒布第二修正案，規範了20種禁用芳香胺。在第二修正案的基礎上，再加上歐盟保健委員會的「EU指令67/1548附錄C2」，提出的對氨基偶氮苯以及2-甲氧基苯胺，一共是22種禁用芳香胺，這也就是1995年到1999年間，一直被使用來規範的22種禁用芳香胺。

On April 10, 1992, the German government announced a plan for a new bill called the "Improving German Physiological Exposure Act" that would ban 15 aromatic amines known to cause cancer. However, the bill was not clear on how to implement control. It was not until July 15, 1994, that the German government promulgated the second amendment to the bill, regulating 20 banned aromatic amines. On the basis of the Second Amendment, coupled with the "EU Directive 67/1548 Annex C2" of the European Commission, the proposed p-aminoazobenzene and 2-methoxyaniline are among a total of 22 banned aromatic amines. These are the 22 banned aromatic amines that have been regulated from 1995 to 1999.

2000

「Oeko-Tex Standard 100」又增加了2,4-二甲基苯胺、2,6-二甲基苯胺兩種，這就是我們常說的常見的24種禁用芳香胺。

In 2000, "Oeko-Tex Standard 100" added two more substances: 2,4-dimethylaniline and 2,6-dimethylaniline. These are the 24 commonly banned aromatic amines that are often referenced.



REGULATIONS BANNING AROMATIC AMINES IN DYES

染料禁用芳香胺法規

→ CHAPTER

07

染料禁用芳香胺法規

Regulations banning aromatic amines in dyes

在染料分子結構中，凡是含有偶氮基 (-N=N-) 的統稱為偶氮染料 (Azo Dyes)，其中偶氮基常與一個或多個芳香環系統，相連構成一個共軛體系而作為染料的發色體，所以偶氮染料幾乎分佈於所有的顏色中，廣泛使用於紡織品、服裝、皮革製品、家居布料等染色及印花工藝。當紡織品、服裝和皮革製品與人體皮膚直接接觸後，某些類型的偶氮染料與人體正常代謝物（如汗液）混合並產生還原反應，能形成致癌的禁用芳香胺化合物而再被人體吸收，這對人體危害極大，而這種偶氮染料就是可致癌的偶氮染料。

當染料經標準的方法進行還原裂解後，如果可經由儀器檢測出限量值以上的禁用芳香胺，該染料即為禁用染料。目前使用的偶氮染料達 3,000 種之多，而可致癌的偶氮染料大約只有 200 多種。自 1998 年 4 月 1 日起，用這種可致癌的偶氮染料做成的製品，若經過法定的分析方法，檢測出含有「MAK 表」中所列之芳香胺，製品則會被禁止在市場上銷售。

目前綠色生態紡織品常見規範「Oeko-Tex Standard 100」，為 1992 年奧地利紡織研究中心，聯合全球知名紡織研究中心組成，成立了「國際紡織品生態研究和試驗協會」（International Association for Research and Testing in the Field of Textile Ecology，簡稱 OEKO-TEX®），總部設於奧地利。該組織推動的「Oeko-Tex Standard 100」紡織品認證，在 2023 年其規定的禁用芳香胺為 32 種。

另外一個綠色生態紡織品常見規範 Bluesign，公司名稱為「Bluesign Technologies AG」總部設於瑞士，是由歐盟學術界、工業界、環境保護及消費者組織代表共同訂定的生態環保規範。Bluesign 認證 2000 年時在德國正式公開，要取得認證需符合禁用芳香胺之規定，目前 Bluesign 2023 年規定的禁用芳香胺達到了 38 種。

In the molecular structure of dyes, those containing azo groups (-N=N-) are collectively called azo dyes. The azo groups are often connected to one or more aromatic ring systems to form a conjugated system. Azo dyes, renowned for their wide range of vibrant colors, are extensively used in dyeing and printing processes in various industries such as textiles, clothing, leather goods, and home furnishing fabrics. When textiles, clothing, and leather products come into direct contact with human skin, certain types of azo dyes can mix with normal human metabolites (such as sweat) and undergo reduction reactions. This process can lead to the formation of carcinogenic banned aromatic amine compounds, which can then be absorbed by the human body. This substance is extremely harmful to the human body because it is carcinogenic.

When a dye undergoes reductive cleavage using standard methods, and if instruments detect aromatic amines above the limit value, the dye is classified as a prohibited dye. There are as many as 3,000 azo dyes in use today, but only about 200 of them are carcinogenic. Starting from April 1, 1998, if products made from this carcinogenic azo dye are found to contain aromatic amines listed in the "MAK Table" through statutory analysis methods, the products will be labeled as prohibited for sale on the market.

The current common standard for green ecological textiles, "Oeko-Tex Standard 100," was established in 1992 by the Austrian Textile Research Center and the world's leading textile research centers to create the "International Association for Research and Testing in the Textile Ecology" (referred to as OEKO-TEX®), headquartered in Austria. The "Oeko-Tex Standard 100" textile certification, promoted by the organization, stipulates that 32 types of aromatic amines will be banned in 2023.

Another common standard for green and ecological textiles is Bluesign. The company's name is "Bluesign Technologies AG," and it is headquartered in Switzerland. It is an ecological and environmental protection standard jointly formulated by representatives of EU academia, industry, environmental protection, and consumer organizations. Bluesign certification was officially announced in Germany in 2000. To obtain certification, you must comply with the regulations regarding banned aromatic amines. Currently, Bluesign has stipulated 38 types of banned aromatic amines for 2023.

事實上各紡織品品牌商也都有自己的審查標準，例如：

In fact, each textile brand also has its own review standards, such as:

Adidas Policy for the Control and Monitoring of Hazardous Substances A-01

H&M Group Chemical Restrictions

VF Corporation Restricted Substance List

Nike Chemistry Playbook

American Apparel & Footwear Association's (AAFA) Restricted Substance List

除此之外，由 23 個品牌商（NIKE, Adidas, H&M.. 等），聯手成立了 ZDHC（The Zero Discharge of Hazardous Chemicals），推動在服裝及其產業鏈中的危險化學物質零排放，廣泛實施可持續化學品的使用規範（生產限用物質清單；MRSL），進而保護員工、消費者以及我們所居的環境。

In addition, 23 brands (Nike, Adidas, H&M, etc.) have jointly established ZDHC (Zero Discharge of Hazardous Chemicals) to promote the elimination of hazardous chemicals discharge in clothing and its industrial chain. They aim to widely implement sustainable chemical usage practices, such as the Manufacturing Restricted Substances List (MRSL), to protect employees, consumers, and the environment in which we live.


染料需監測的化學品

Chemicals to be monitored for dyes

21 世紀的今天，關於染料的生態保護及毒理方面的研究議題，隨著人們追求安全與環保的意識抬頭，日益引起大家的重視。針對染料中危害化學品的管控也越來越多，除了禁用芳香香以外，還有很多我們關注的化學品需要監測。如：

Today, in the 21st century, research on ecological protection and the toxicology of dyes has garnered increasing attention as people's awareness of safety and environmental protection grows. There are also increasing regulations on hazardous chemicals in dyes. In addition to banning aromatic fragrances, there are many chemicals that we are concerned about and need to monitor:

烷基酚聚氧乙烯醚 (APEOs)	Alkylphenol oxyethylene ethers (APEOs)
烷基酚 (APs)	Alkylphenols (APs)
胺類	Amines
氯化代苯和氯化代甲苯類	Chlorinated benzene and chlorinated toluenes
氯化代苯酚	Chlorinated phenol
喹啉及異喹啉	Quinoline and isoquinoline
多環芳香烴 (PAHs)	Polycyclic Aromatic Hydrocarbons (PAHs)
可致癌及可致敏著色劑	Carcinogenic and sensitizing colorants
金屬	Metals
其他化學物質 (烷基萘所有衍生物、氯化苳、雙酚 A ... 等)	Other chemical substances include derivatives of alkylnaphthalene, benzyl chloride, bisphenol A, etc.



MONITORING CHEMICALS: SAFEGUARDING GREEN DYES

監測化學物質：為綠色染料保駕護航

→ CHAPTER

08

監測化學物質：為綠色染料保駕護航

Monitoring Chemicals: Safeguarding Green Dyes

隨世界潮流的腳步，台唐工業持續致力於染料安全與環保的議題，在染料精細化學品的環保要求日益嚴格的情況下，於 2014 年成立了貴重儀器中心 (Instrumentation Center)，自主強化把關染料中的禁用物質。貴重儀器中心的成立，目的在控管產品中禁用化學物質，以符合各種限制物質規範，使得客戶可以放心的使用。

T&T Instrumentation Center is committed to staying abreast of global trends by emphasizing dye safety and environmental protection. As environmental protection requirements for dye fine chemicals become increasingly stringent, the company established the Instrumentation Center in 2014 to improve independent control over dye production. Banned Substances. The Precious Instrument Center was established to prohibit the use of chemical substances in controlled products to comply with various restricted substance regulations, ensuring that customers can use them with confidence.



台唐工業貴重儀器中心 Instrumentation Center T&T



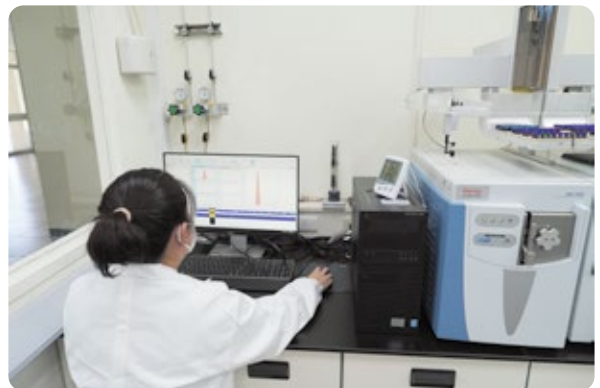
台唐工業貴重儀器中心同仁 Members of Instrumentation Center

台唐工業貴重儀器中心目前編制人員10人，百萬級儀器設備現有「氣相層析質譜儀」(Gas Chromatograph-Mass Spectrometry, GC-MS)兩套、「高效液相層析儀」(High Performance Liquid Chromatography, HPLC)三套、以及一套「離子層析法儀」(Ion Chromatography, IC)。

T&T Instrumentation Center currently has a staff of 10 people. Its equipment includes two sets of "gas chromatography mass spectrometers" (GC-MS), three sets of High Performance Liquid Chromatography (HPLC), and one set of Ion Chromatography (IC).



感應耦合電漿質譜儀 (Inductively Coupled Plasma Mass Spectrometry, ICP-MS)



氣相層析質譜儀 (Gas Chromatograph-Mass Spectrometry, GC-MS)

千萬級儀器設備則擁有一套「感應耦合電漿質譜儀」(Inductively Coupled Plasma Mass Spectrometry, ICP-MS)，未來更計畫引進兩套「高性能液相層析串聯質譜儀」(HPLC/MS—MS)，以及兩套「氣相層析串聯質譜儀」(GC-MS/MS)。

The tens-of-million-level instrument equipment includes an "Inductively Coupled Plasma Mass Spectrometry (ICP-MS)" (Inductively Coupled Plasma Mass Spectrometry, ICP-MS), and plans to introduce two sets of "High-Performance Liquid Chromatography Tandem Mass Spectrometer" (HPLC/MS-MS) and two sets of "Gas Chromatography Tandem Mass Spectrometer" (GC-MS/MS).

台唐重視每一位客戶的需求與安全，全面與國際社會接軌，吸收並發展最新的染料議題，研究並了解全球各組織與品牌關注的項目，期盼能與所有客戶一同成長並茁壯。

T&T Industrial attaches great importance to the needs and safety of every customer. The company fully integrates with the international community, absorbs and develops the latest dye technologies, researches and understands the projects of concern to organizations and brands worldwide, and aims to grow and thrive with all customers.



離子層析法 (Ion Chromatography, IC)



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