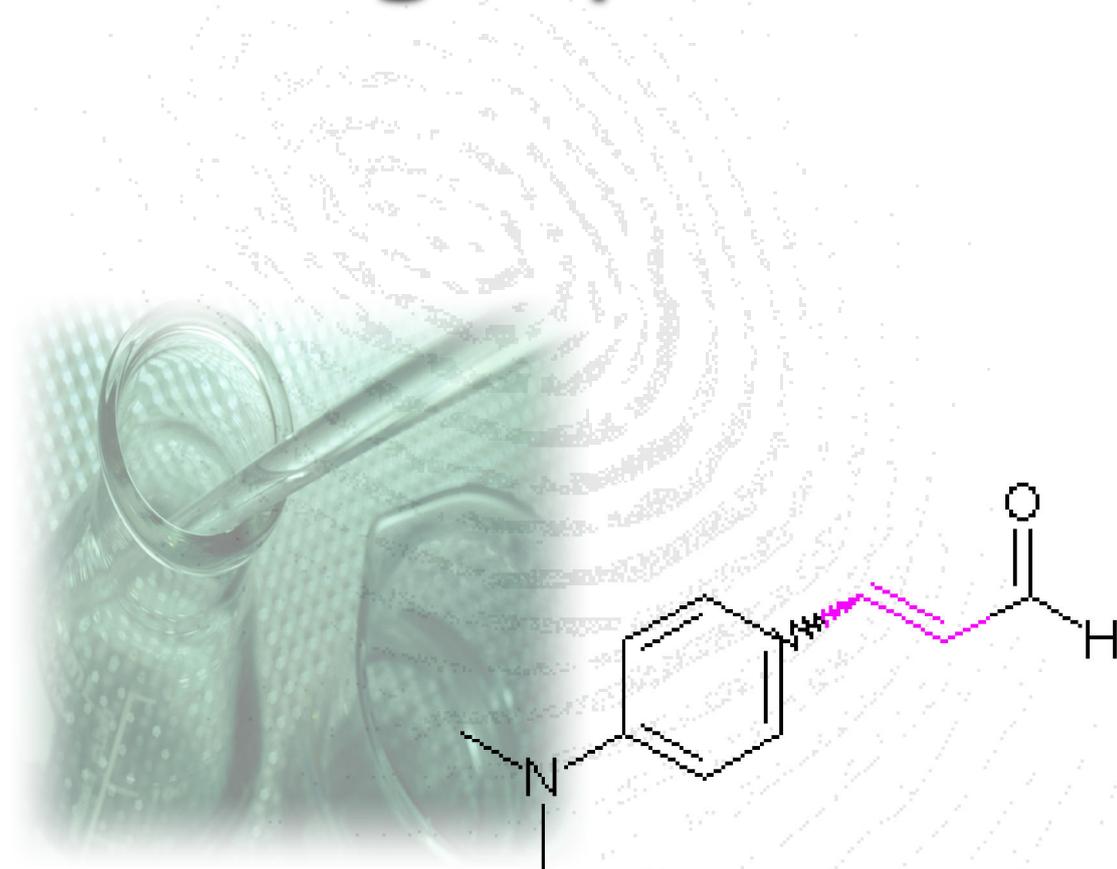
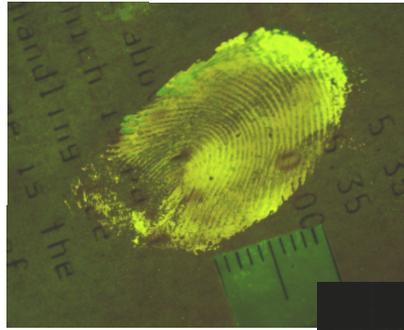


Chemical Development For Latent Fingerprints



4-Dimethylaminocinnamaldehyde
Multi Metal Deposition



Chemical development of Latent Fingerprints on thermal papers



Thermal papers

Thermal paper such as fax rolls and till receipts have always presented a problem for the recovery of latent fingerprint impressions. Until recently it was relatively unusual to receive this type of paper, however times have changed and today about 70% of all receipts are on thermal paper, some railway tickets are thermal (usually those issued on the trains) and some thermal fax paper is still used.

The traditional method of fingerprint development involves the use of either Ninhydrin or DFO. Both of these processes react primarily with the Amino acid content of our sweat, The Ninhydrin develops visible fingerprint impressions whilst the DFO develops fingerprints which can only be seen with a high intensity light source.

However both of these processes usually cause the thermal side of the paper to go completely black totally obscuring any fingerprint impressions.

At last thanks to the Australian Federal Police we have an alternative solution called [Dimethylaminocinnamaldehyde\(DMAC\)](#). The fingerprint above was developed with DMAC on thermal fax paper and photographed with the DCS 121. If I had used either Ninhydrin or DFO the paper would have gone completely black obscuring all fingerprint detail.

DMAC is both effective and very simple to use.

Please ensure that you check the health and safety data hazard sheets before you use the chemicals and do a full COSHH assessment. Always ensure that you handle the chemicals in a fume cupboard and wear the appropriate personnel protective clothing.

DMAC

To use this process you require some dry transfer sheets (you can use standard photocopy paper) prepared as follows in a fume cupboard :-

1. Weigh out 0.25 grams of DMAC and dissolve it into 100 ml of methanol.
2. Pour a small amount of DMAC solution into a tray of about the same size as the transfer sheets.
3. Soak clean sheets of paper (I.e. Photocopy paper) in the solution.
4. Take out the sheets one at a time allowing the excess chemical to drip back into the tray.
5. Hang the sheets to air dry.



6. Place the sheets in a sealed plastic bag and store in a refrigerator with the appropriate health and safety labelling.

It is recommended that you use **two plastic bags** or one with very thick plastic as the DMAC can transfer through.

Once the sheets have been treated they have a shelf life of about 6 months (depending on use). They must be stored in the fridge at all times. Never handle the treated DMAC papers without suitable chemical resistant gloves.

Development of Fingerprints

1. Place the exhibit between two transfer sheets.
2. Place aluminium foil on either side of the two pieces of paper.
3. Place the items together in a dry press and leave for 2 hours or overnight. (For best results use a cold dry clothes press.)

Viewing with High Intensity Light Sources

The developed fingerprint impressions will only be visible when examined with the Quaser/Polylight. The Quaser 2000 requires a filtration of 400-519 with a viewing filter of 510nm.

The Polylight requires 415 or 440 Polylight band with a band pass if 505/565nm or GG490/OG515 barrier filter.

Other light sources use a 529 nm filter

All exhibits should be re-examined after 24 hours.

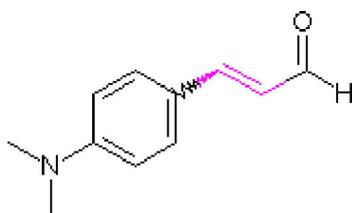
Cold/Hot press

The recommended type of cold press can be seen in the adjacent picture,



4-Dimethylaminocinnamaldehyde (DMAC)

Molecular Formula

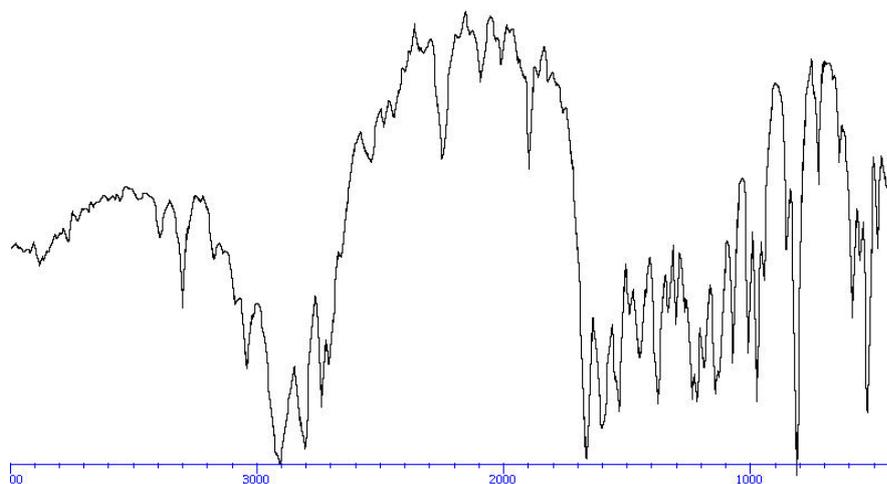


C11 H13 N O

Melting Point (°C)

137 - 142

Infra Red Spectra



Hazard

European/International Regulations European Labelling in Accordance with EC Directives

Hazard Symbols: XI

Risk Phrases: R 36/37/38 Irritating to eyes, respiratory system and skin.

Safety Phrases: S 24/25 Avoid contact with skin and eyes. S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S 28A After contact with skin, wash immediately with plenty of water.

ALWAYS USE APPROPRIATE PERSONAL PROTECTIVE CLOTHING

**** MATERIAL SAFETY DATA SHEET ****

4-Dimethylaminocinnamaldehyde, 98%

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 4-Dimethylaminocinnamaldehyde, 98%

Catalog Numbers:

11579-0000, 11579-0050, 11579-0250

Synonyms:

Company Identification (Europe): Acros Organics BVBA
Janssen Pharmaceuticaaan 3a
2440 Geel, Belgium

Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410

For information in North America, call: 800-ACROS-01

For information in Europe, call: 0032(0) 14575211

For emergencies in the US, call CHEMTREC: 800-424-9300

For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#	Haz
6203-18-5	4-Dimethylaminocinnamaldehyde	98%	228-267-0	

Hazard Symbols: XI
Risk Phrases: 36/37/38

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Irritating to eyes, respiratory system and skin.

Potential Health Effects

Eye:

Causes eye irritation.

Skin:

Causes skin irritation. May be harmful if absorbed through the skin.

Ingestion:

May cause irritation of the digestive tract. May be harmful if swallowed.

Inhalation:

Causes respiratory tract irritation. May be harmful if inhaled.

Chronic:

Not available.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:

Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:



Get medical aid. Wash mouth out with water.

Inhalation:

Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.

Extinguishing Media:

In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Vacuum or sweep up material and place into a suitable disposal container.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Avoid breathing dust, vapor, mist, or gas. Avoid contact with skin and eyes.

Storage:

Store in a cool, dry place. Store in a tightly closed container.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate ventilation to keep airborne concentrations low.

Personal Protective Equipment

Eyes:

Wear safety glasses and chemical goggles if splashing is possible.

Skin:

Wear appropriate protective gloves to prevent skin exposure. Wear appropriate protective clothing to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to minimize contact with skin.

Respirators:

Wear a NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Powder
Color: orange - yellow
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: 137.00 - 142.00 deg C



Autoignition Temperature: Not available.
Flash Point: Not available.
Explosion Limits, lower: Not available.
Explosion Limits, upper: Not available.
Decomposition Temperature:
Solubility in water:
Specific Gravity/Density:
Molecular Formula: (CH3)2NC6H4CH=CHCHO
Molecular Weight: 175.23

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials.
Incompatibilities with Other Materials:
Strong oxidizing agents.
Hazardous Decomposition Products:
Carbon monoxide, oxides of nitrogen, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 6203-18-5 unlisted.
LD50/LC50:
Not available.
Carcinogenicity:
4-Dimethylaminocinnamaldehyde -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

**** SECTION 14 - TRANSPORT INFORMATION ****

IATA
No information available.
IMO
No information available.
RID/ADR
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XI
Risk Phrases:
R 36/37/38 Irritating to eyes, respiratory system
and skin.
Safety Phrases:
S 24/25 Avoid contact with skin and eyes.
S 26 In case of contact with eyes, rinse immediately
with plenty of water and seek medical advice.
S 28A After contact with skin, wash immediately with
plenty of water.

WGK (Water Danger/Protection)
CAS# 6203-18-5: 2



United Kingdom Occupational Exposure Limits

United Kingdom Maximum Exposure Limits

Canada

CAS# 6203-18-5 is listed on Canada's DSL List.

CAS# 6203-18-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

US FEDERAL

TSCA

CAS# 6203-18-5 is listed on the TSCA inventory.

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 7/16/1996 Revision #0 Date: Original.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

eneate

Imaging

Methanol

SAFETY DATA SHEET

Date of issue: 21/08/02

1. Identification of the substance/preparation and of the company/undertaking

Identification of the product

Catalogue No: P20903

ID No.: 1015800

Product name: **Methanol**

Use of the substance/preparation: General chemical reagent / Organic solvent

Manufacturer/supplier identification

Company: VWR International Ltd
Hunter Boulevard, Magna Park, Lutterworth, Leicestershire, England, LE17 4XN
Telephone : + 44 (0) 1455 558600 Telefax : + 44 (0) 1455 558586

Emergency telephone No.: + 44 (0) 1202 669700

2. Composition/information on ingredients

Chemical characterization

Organic liquid

Product name: Methanol

Synonyms: Methyl alcohol, carbinol, wood alcohol

CAS number: 67-56-1

EC-No.: 200-659-6

EC Index No.: 603-001-00-X

Molecular formula: $\text{CH}_3\text{OH} = 32.04 \text{ g/mol}$

3. Hazards identification

Highly flammable. Toxic by inhalation, in contact with skin and if swallowed. Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

4. First aid measures

- Eye contact: Irrigate thoroughly with water for at least 10 minutes. OBTAIN MEDICAL ATTENTION.
- Inhalation: Remove from exposure, rest and keep warm. In severe cases obtain medical attention.
- Skin contact: Wash off skin thoroughly with water. Remove contaminated clothing and wash before re-use. Unless contact has been slight, OBTAIN MEDICAL ATTENTION.
- Ingestion: Wash out mouth thoroughly with water and give plenty of water to drink. OBTAIN MEDICAL ATTENTION.

5. Fire-fighting measures

Special risks:

Highly flammable. Vapour/air mixture explosive. May evolve toxic fumes in fire.

Suitable extinguishing media:

Water spray, dry powder or vaporising liquids

Do not stay in dangerous zone without respiratory protective equipment. Prevent fire fighting water entering watercourses or ground-water.

6. Accidental release measures

Shut off all sources of ignition. Inform others to keep at a safe distance. Wear appropriate protective clothing. Ensure supply of fresh air in enclosed rooms.

Absorb on an inert absorbent, (e.g. BDH Spillage absorption granules), transfer to a suitable container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

For large spillages liquids should be contained with sand or earth and both liquids and solids transferred to salvage containers. Any residues should be treated as for small spillages.

7. Handling and storage

Handling:

Take precautions against static discharge. All electrical equipment must be flameproofed. Wear appropriate protective clothing. Work under fume extractor. Do not inhale substance. Do not empty into drains.

Storage:

Store at room temperature (15 to 25°C recommended). Keep well closed and protected from direct sunlight and moisture. Store small containers in suitable flammable liquid storage cabinets when not in use. Larger drums (200l) must be kept in purpose-built stores.

8. Exposure controls/personal protection

UK Exposure Limits:

WEL - Methanol:

Long-term: 266 mg/m³ (200ppm) Short term: 333 mg/m³ (250 ppm) (Sk, IL V)

Monitoring procedure:

Draw a known quantity of workplace air through a tube packed with silica gel, desorb the substance and determine its concentration by chromatography. (GLC-FID) (NIOSH 2000, OSHA 91)

Personal protective equipment:

Engineering methods to control or prevent exposure are preferred. Methods could include process enclosure or mechanical ventilation.

As appropriate to the situation and the quantity handled.

- Ventilation: Fume cupboard, flameproof
- Respirator: Self-contained breathing apparatus
- Gloves: Butyl rubber, Viton™, PE/EVAL (Silver Shield). Gloves subject to permeation or any sign of degradation must be removed and replaced immediately.
- Eye Protection: Goggles or face-shield
- Other Precautions: Plastic apron, sleeves, boots - if handling large quantities

Environmental exposure controls:

Do not allow to enter drinking water supplies, waste water, or soil!

9. Physical and chemical properties

General information:

Form: liquid
Colour: colourless
Odour: characteristic

Health, safety and environmental information:

Melting temperature -98°C
Boiling temperature 65°C
Density(g/ml) 0.79
Vapour pressure 128 hPa (20°C)
Relative vapour density: 1.11 (air = 1)
Evaporation rate: 460 (n-Butyl acetate = 100)
Solubility in water Miscible in all proportions
Other solubility data: Benzene: Miscible in all proportions
Diethyl ether: Miscible in all proportions
Flash point 12°C
Explosion limits: lower: 7.3 %v/v
upper: 37 %v/v
Auto-ignition temperature 464°C
Viscosity: 0.614 mPas (20°C)
Log P(o/w): -0.66 / -0.82
Additional data: Refractive index: 1.3285 (20°C)
Dipole moment: 1.7 Debye (20°C)
Dielectric constant: 32.6 (25°C)

10. Stability and reactivity

Stable.

Substances to be avoided

acid halides, alkali metals, alkaline earth metals, oxidizing agents, hydrides, zinc diethyl, halogen compounds, chloroform (in the presence of: alkali hydroxides).

The possibility of reaction with other substances cannot be excluded.

11. Toxicological information

- After ingestion: toxic.
 - After inhalation of vapours: Irritation symptoms in the respiratory tract.
 - After contact with substance: Irritation of: eyes, mucous membranes.
 - After the absorption of large quantities: nausea, vomiting, headache, inebriation, impaired vision, blindness(Irreversible damage of the optical nerve.).
 - Systemic effect: acidosis, drop in blood pressure, agitation, spasms, narcosis, coma.
- The onset of symptoms may be delayed.

Further data

LDLo (oral, human): 143 mg/kg
LD50 (oral, rat): 5628 mg/kg.

LC50 (inhalation, rat): 64,000 ppm/4h
Skin irritation test (rabbit): moderate irritant effect
Eye irritation test (rabbit): moderate irritant effect
Ames-Test: negative
Sensitization test (guinea pig): negative
We have no evidence of carcinogenic effects. Evidence of reproductive effects.

12. Ecological information

Low aquatic toxicity. Bioaccumulation potential: low (Log Pow <2). Biological degradability: good.

Further ecological data:

Henry constant: 0.044 Pa.m³/mol Koc: 2

Fish toxicity:

LC50 (Salmo gairdneri): 13,000 mg/kg/96h

LC50 (Pimephales promelas): 29,000 mg/l/96h

LC50 (Lepomis mochochirus): 15,400 mg/l/96h

Daphnia toxicity:

EC50 (Daphnia magna): >10,000 mg.kg/24h

ThOD: 1.5 g/g

BOD5: 62% of ThOD

COD: 70-100% of ThOD

Remarks:

Adverse ecological effects cannot be excluded in the event of improper handling or disposal.

13. Disposal considerations

Chemical residues are generally classified as hazardous or special waste, and as such are covered by regulations which vary according to location. Contact your local waste disposal authority for advice, or pass to a chemical disposal company. Rinse out empty containers thoroughly before returning for recycling.

When recovery and recycling is not possible, incineration in a high temperature incinerator is the recommended method of disposal.

14. Transport information

UN-No.: 1230

Class: 3 / 6.1

Packaging group: II

Proper shipping name: METHANOL (METHYL ALCOHOL)

15. Regulatory information

Labelling according to EC directives

Symbol(s): F T Highly flammable. Toxic.

R-phrases: R11-23/24/25-39/23/24/25

Highly flammable. Toxic by inhalation, in contact with skin and if swallowed. Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

S-phrases: S7-16-36/37-45

Keep container tightly closed. Keep away from sources of ignition - No smoking. Wear suitable protective clothing and gloves.

In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

EC-No.: 200-659-6

Local Regulations

Within the UK, the use of this material must be assessed under the Dangerous Substances and Explosive Atmospheres (DSEAR) Regulations.

U.K. Transport Category 2

Within the UK, the use of this material must be assessed under the Control of Substances Hazardous to Health (COSHH) regulations.

16. Other information

Revision.

Supersedes edition of: 01/11/99

Reason for alteration: General update.

Date of issue: 21/08/02

Date of print: 19/10/05



Multimetal Deposition Reagent

The two fingerprints shown above were developed with MMD and photographed on the DCS-3 they were located on the following surfaces :-

1. The fingerprint on the left was recovered from a beer can, the can had been recovered outside in extremely wet conditions.
2. The fingerprint on the right was recovered from a white plastic carrier bag, the bag was found outside in extremely wet conditions.

The standard processing method for this type of non porous surface is cyanoacrylate fuming, however in this instance the cyanoacrylate would simply coat the entire surface white. It would in fact recover no fingerprint impressions at all. However as you can see the Multi metal deposition process works very well indeed. It is a wet process requiring no specialist equipment (I. E. Vacuum metal deposition chamber) however it should only be undertaken by experienced laboratory technicians.

The application of this process requires five distinct steps.

1. Distilled water
2. Colloidal Gold
3. Distilled Water
4. Physical developer (modified)
5. Distilled Water

As with standard Physical developer all the glass ware must be scrupulously clean. Use each of the above dishes in the following manner :-

1. If the item is non porous rinse briefly (5-10mins) in distilled water, for paper substrates soak in several changes of distilled water for 20 - 30 minutes.
2. Immerse the exhibit in colloidal gold solution for 30 - 120 minutes (about 60 minutes is usually sufficient) some fingerprints may develop at this stage, but generally nothing is visible at this point.
3. Rinse the exhibit in distilled water
4. Prepare the working modified physical developer solution, this solution can only be used for 1 treatment or 1 item, it has a life span for a maximum of 10 minutes.
5. Immerse the exhibit in the physical developer solution, and as soon as the exhibit starts to turn colour remove it from the bath. This generally takes about 1-5 minutes max. Don't be tempted to leave it in this bath for too long, it reacts very differently to the standard Physical developer formulation.
6. Rinse the exhibit in distilled water, then thoroughly in running tap water.
7. Leave to dry at ROOM temperature, generally leave it overnight

See the chemical mixing instructions on the following pages.

Preparation of Colloidal Gold Solution

This process requires the use of a laboratory 'Hot Plate' to bring the chemicals to the boil, Please ensure that you follow all the **Health and safety guidelines** and only mix the chemicals in an **approved Fume cupboard**.

1. Preparation of 10% w/v stock gold chloride solution, 10ml

1g Tetrachloroauric acid (gold chloride) dissolved in 10ml of high quality distilled water.

2. Preparation of 1% w/v stock sodium citrate solution, 100ml

1g Sodium citrate dissolved in 100ml of distilled water.

3. Preparation of 0.5 M citric acid solution, 500ml

48g of citric acid dissolved in 500ml of distilled water

4. Preparation of colloidal gold working solution, 1 litre

1ml stock gold solution added to 1 litre of distilled water, bring to the boil then add 10ml stock sodium citrate solution Boil gently for 10 minutes.

The solution should now be the colour of Port Wine NB: Do not drink the solution!

While the solution is still hot stir in 5ml of Tween 20, then cool.

Adjust the PH to about 3 with 0.5M Citric Acid (Solution 3) usually about 10 ml. The most cost effective way to measure the PH is to use litmus papers which change colour according to the PH.

Restore the volume to 1 litre with Distilled water.

The final solution should be stored in a scrupulously clean glass or plastic bottle in a refrigerator. The shelf life is at least two years.

The PH should be checked (and adjusted if necessary) prior to use.

NB: If the solution separates it should be discarded. This is usually caused through the use of contaminated glasswear.

Preparation of Modified Physical developer.

Redox Stock Solution 1 litre

16g Ferric Nitrate dissolved in 1 litre of distilled water, then add 44g of Ammonium Ferrous Sulphate, then add 11g of Citric Acid and stir until dissolved, then add 0.25 ml of 1% Tween 20.

Silver Nitrate Stock Solution.

10g Silver Nitrate dissolved in 100 ml of distilled water.

The solution is colourless and clear and should be stored in a dark bottle at room temperature. It has a shelf life of about 1 year.

Preparation of modified physical developer working solution

2ml Silver nitrate solution added slowly with stirring to 100 ml of Redox stock solution.

Once mixed the shelf life is only about 10 minutes (MAX).