

FORENSIC SCIENCE
IV SEMESTER
UNIT -IV

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Microchemical Tests:

- Gross similarity or otherwise between two paint samples may be studied by putting them in a series of chemicals described below and observing the reactions under low power microscope .
- This test may be carried out in a porcelain spot plate by putting few drops of the liquid in each well. About 2 sq. mm or 3 mg of sample is put in each of the chemical.
- Change in colour or bleeding of colour, solubility, effervescence of gases, scaling out of layers etc. are noted.
- Similar behaviour of the paint samples in all the chemicals strongly indicates the commonness of origin between the samples.
- Since the sample requirement for the test is more, therefore it should first be applied to the control sample and the most reactive chemicals are to be applied to the limited exhibit sample.

Recommended chemicals for this purpose are-

- 1) Conc. H₂SO₄,
- 2) Conc. HNO₃,
- 3) Conc. HCl,
- 4) Conc. NaOH,
- 5) Ammonium Sulphide,
- 6) Acetone,
- 7) Ethyl Acetate,
- 8) Diphenylamine Reagent {0.3 gm of Diphenylamine in 20 ml of H₂ SO₄ and 10 ml of glacial acetic acid} and

9) Le Rosen Reagent { 10 drops of 37% Formaldehyde adding drop wise in 10ml of Sulphuric Acid }

Differential solubility and TLC

Solubility of the paint samples may be tried in a number of solvents such as

- 1) Acetone,
- 2) Ethyl Acetate,
- 3) Chloroform,
- 4) Benzine,
- 5) Methyl Alcohol,
- 6) Methlene Chloride,
- 7) Dimethyl Formamide and
- 8) Xylene.

Solubility or partial solubility of the sample is noted.

The soluble component of the paint may be examined by thin layer chromatography using appropriate solvent system.

Worksheet for solubility

S.N. Sample/exhibit No. Solvent used Solubility status Inference

TLC Analysis

Sample/Exhibit No.

Solvent used

Spray Reagent used

Number of Spots & Colour

Conclusion:

Additional Instrumental Techniques for Identification of Paints

- Identity between two or more paint samples may be established by comparative study with the help of the techniques described above.
 - However, paints are manufactured by different manufacturers using variety of vehicle combinations.
 - Similarly there are numerous kinds of metallic and organic pigments that may produce similar colour, although those are totally different in compositions.
 - Furthermore, on most occasions, only the topcoat of automobile paint or a transferred smear of the surface paint are received in the Laboratory.
 - Therefore, it is necessary to evaluate the organic and inorganic components present in the paint sample.
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- Several Laboratory methods are now available for identification of type of the vehicle as well as the pigments used in the paint. Subject to availability, following methods may be used for generic identification of the paint sample.

Infra-red Spectroscopy

In recent times Infra-red Spectroscopy has been widely applied for identification of paint vehicles as well as pigments. Advent of low cost FTIR Instruments with various sampling techniques like Diffuse reflectance (DRIFTS), Diamond Anvil Cell (DAC) and Microscope FTIR makes it possible to obtain Infrared Spectra without any pre-processing. Sample requirement in DAC and Microscopic FTIR Techniques is very small.

Pyrolysis gas chromatography

- Pyrolysis Gas Chromatography is an ideal technique for identification of the vehicle component of the paint.
- This technique is considered more sensitive than the Infra-red Spectroscopy for identification of organic component.
- The technique although destructive, sample requirement is very small and information received is very specific .

Elemental analysis of the pigments

- Identification of the metallic components present in the pigment can be made with Emission Spectrography or ICP emission Spectrometer.
- Among other techniques, SEM-EDX, AAS, X-ray Fluorescence and NAA techniques are also applicable for identification of pigment composition.
- Major element of the pigment and trace element profile between two paint samples may be compared to establish the identity of the pigments .

X-ray Diffraction

- X-ray Diffraction Technique on the other hand can reveal the crystalline characteristic of the paint, which are absolutely individual to the compounds.
- Thus information available from x-ray diffraction is more complete than the other techniques .