

Chemical and Instrumental Analysis of Paint.

INTRODUCTION

- ▶ Analysis of paint samples plays an important role In investigation of cases like hit and run, theft, House break or burglary etc..
- ▶ Examination of found questioned sample is done using various chemical and instrumental techniques with comparison to collected controlled sample from a location to establish the relation between them i.e if they belong to same source of origin or not.

COMPONENTS OF PAINT

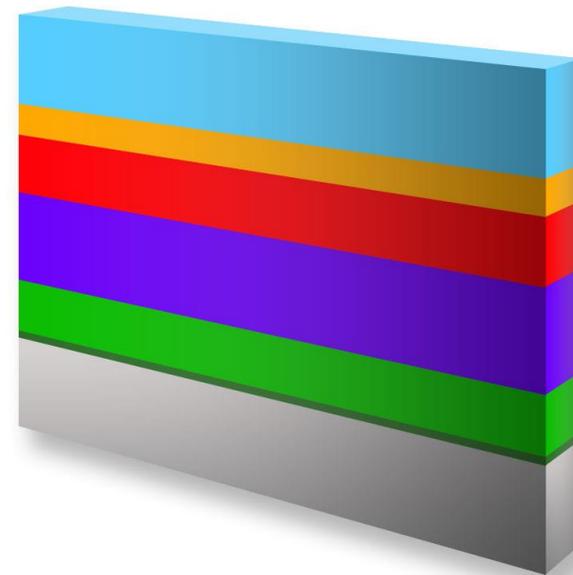
- ▶ Paint is a liquid mixture of four chemicals.
- ▶ i.e
 1. Pigment
 2. Binder
 3. Solvent
 4. Additives

COATING

- ▶ Coatings are layers of covering of paint and other solvents applied to surface of an object.
- ▶ There are three basic coatings.

1. Primer
2. Base coat
3. Clear coat

Vehicle
Coatings
(Not to scale)



Clearcoat (30-50 μm)

Optional Multicoat (5-20 μm)

Basecoat/Color (10-20 μm)

Primer (30-35 μm)

E-coat (17-22 μm)

Pre-Treatment (1 μm)

Body - Aluminum or Steel

ANALYSIS

- ▶ Analysis of paint sample is done on the basis of physical and chemical characteristics of collected sample.
- ▶ Under physical examination we observe the marks on paint, colour, texture, layers, thickness and weather.
- ▶ Chemical examination give information about composition of paint Like pigment, solvent, additives.

Contd..

► Instrumental techniques used for analysis of paint are as follows;

1. **Microscopy**
2. **Chromatography**
3. **Spectroscopy**

Microscopy

- ▶ Paint layer structure can be observed under microscope by cutting the sample obliquely with a scalpel blade for better layer visualisation.
- ▶ Colour, thickness, Pigment appearance, surface structure, Metallic and pearlescent flake size and distribution, layer defects can be also observed under various type of microscope.

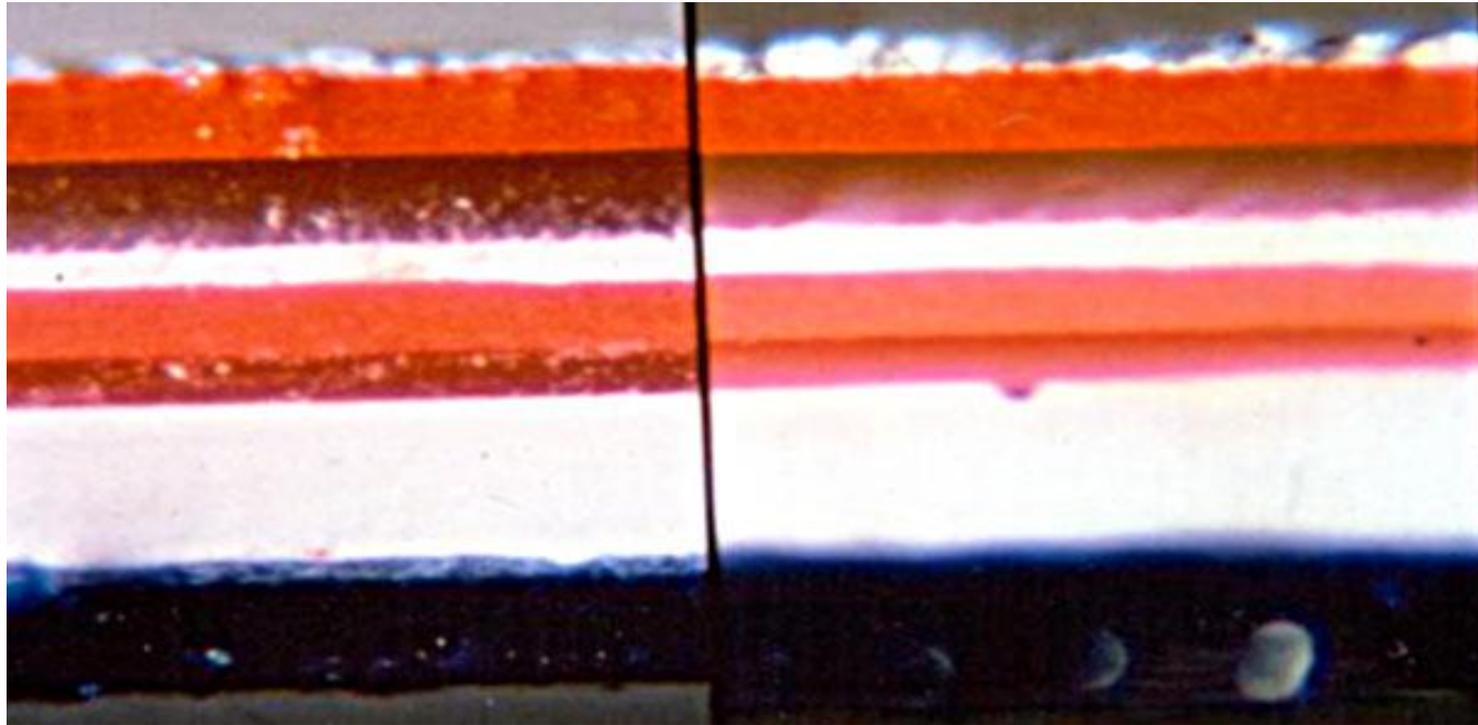
Transmission electron microscope

Stereo microscope

Polarized light microscope

Scanning electron microscope

Comparison microscope



(Side by side comparison under comparison microscope)

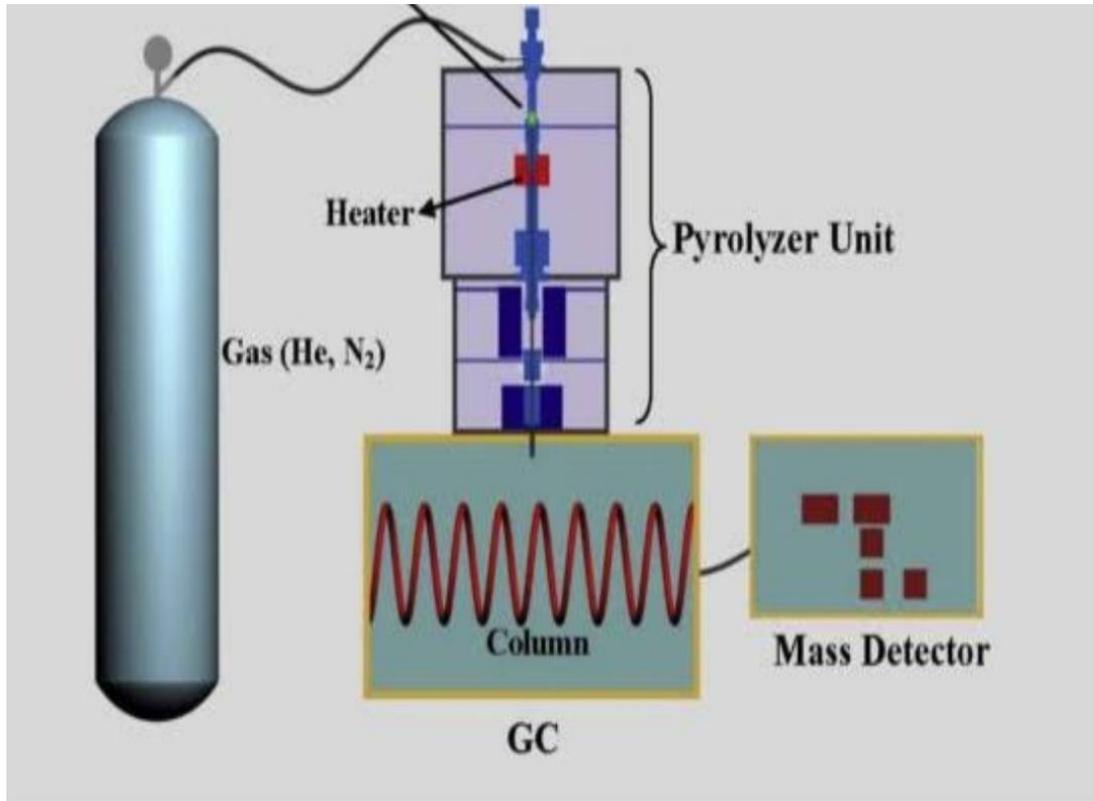
Spectroscopy

- ▶ Various spectroscopic methods are used for analysis of paint are,
 1. IR Spectroscopy
 2. X-ray fluorescence spectroscopy
 3. Microspectro photometry
 4. Raman spectroscopy

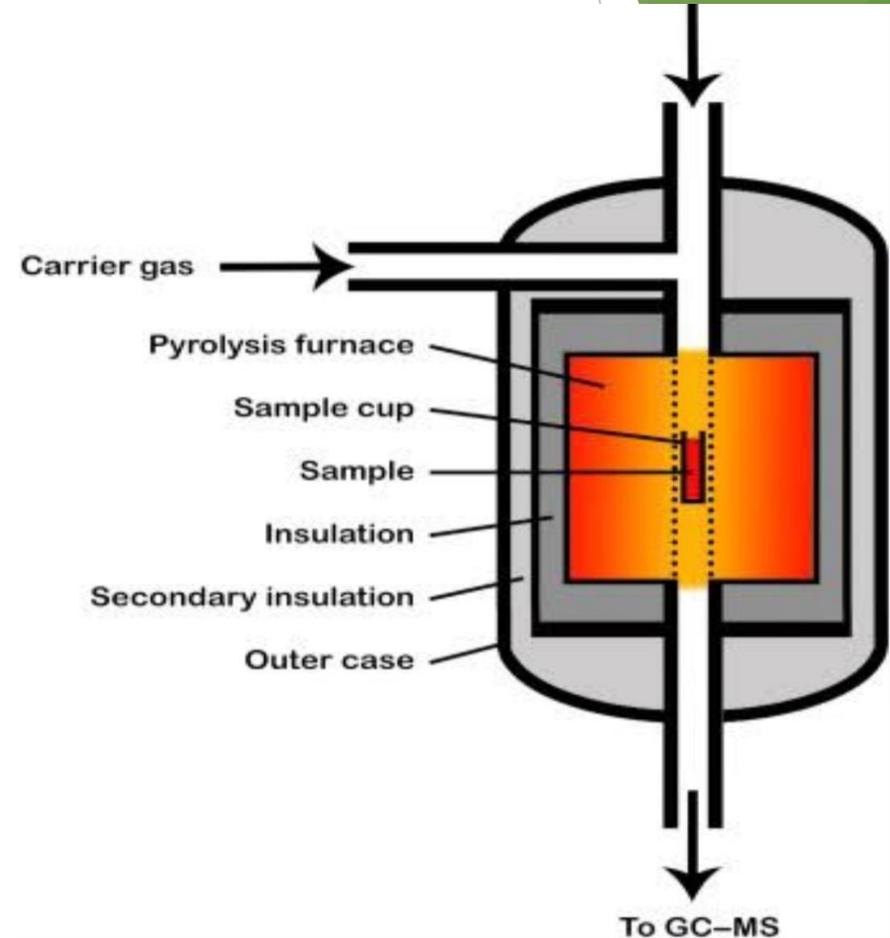
Pyrolysis-GC-MS

- ▶ This is the most effective technique for paint composition analysis.
- ▶ **Pyrolysis–gas chromatography–mass spectrometry (Pyr-GC–MS)** is a technique which thermally decomposes the large high-molecular weight molecules of a sample via heat mediated cleavage in the presence of an inert atmosphere, or a vacuum, to create a suite of smaller low molecular weight fragments.
- ▶ The pyrolyzates are then chromatographically separated in the same manner as traditional GC-MS.
- ▶ Once the pyrolyzates are separated, the sample is then moves to mass spectrometer where we get information about the molecule.

Contd..



(Pyrolysis-GC-MS)



(Pyrolyser)

Thank you...