# 9.4 Chemical Reactivity

## 9.4.1 Introduction

### 9.4.1.1

Chemical reactivity tests are to be utilized in the comparison of questioned and known samples. The observed reactions and chemical changes are used for this comparison.

### 9.4.1.2

Several different chemical reagents can be used to examine paints. Some of these reagents and the reactions expected with them are listed below.

| REAGENT | PAINT | REACTION |
|---|---|---|
| Methyl Ethyl (MEK) | Acrylic Lacquer | Soluble |
| | Acrylic Enamel | Insoluble |
| | Nitrocellulose | Soluble |
| Diphenylamine (DPA) | Nitrocellulose | Turns dark blue and color bleeds out into reagent |
| | Pigments | May turn different colors |
| Chloroform | Acrylic Lacquer | Soluble |
| | Acrylic Enamel | Insoluble |
| | Nitrocellulose | Insoluble |
| Acetone | Acrylic Lacquer | Soluble |
| | Acrylic Enamel | Insoluble |
| | Nitrocellulose | Soluble |
| Concentrated Sulfuric Acid | Pigments | May turn different colors |
| | Especially good with multi-layered white paints | |
| Le Rosen (Marquis) | Pigments - House Paints | May turn different colors |
| Xylene | Acrylic lacquers: | |
| | Dispersion | Soluble |
| | Solution | Insoluble |
| Hot Glacial Acetic Acid | Acrylic-Melamine | Soluble |
| | Dispersion (NAD) and Solution enamels | Soluble |
| | Water-borne acrylic-Melamine enamels | Insoluble |
| Saturated NaOH | Pigments | May react |

## 9.4.2 Safety Considerations

### 9.4.2.1

Standard Laboratory Safety Precautions

### 9.4.2.2

Hazard Identification

| Chemical | Health | Flammability | Reactivity |
|---|---|---|---|
| Sulfuric Acid | 3 | 0 | 2 |
| Chloroform | 2 | 0 | 0 |
| Acetone | 1 | 3 | 0 |
| Methyl Ethyl Ketone | 1 | 3 | 0 |
| Formaldehyde | 3 | 2 | 0 |
| Xylene | 1 | 3 | 0 |
| NaOH | 3 | 0 | 1 |
| Acetic Acid | 2 | 2 | 1 |

## 9.4.3 Preparations

- Diphenylamine solution (DPA): Add 0.25g of diphenylamine to 80% $H_2SO_4$ or 0.3g of diphenylamine to 20 ml concentrated $H_2SO_4$ and 10ml glacial acetic acid.
- Methyl Ethyl Ketone (MEK): Reagent Grade
- Chloroform: Reagent Grade
- Acetone: Reagent Grade
- Concentrated Sulfuric Acid, $H_2SO_4$, (18.0M)
- Le Rosen Reagent: 10 drops of 37% Formaldehyde to 10 ml conc. $H_2SO_4$
- Xylene: Reagent Grade
- Sodium Hydroxide: Reagent Grade
- Glacial Acetic Acid: Reagent Grade
- Spot Plates
- Stereomicroscope

## 9.4.4 Instrumentation

Stereomicroscope

## 9.4.5 Minimum Standards & Controls

Reagents (mixture of chemicals) will be checked to ensure they are working before use.

Work sheet will indicate all chemical tests performed and results.

## 9.4.6 Procedure or Analysis

### 9.4.6.1

Place known and unknown paint chips in a spot plate next to each other to allow for their simultaneous observations.

### 9.4.6.2

Apply reagent directly onto each chip. Use one to two drops. When necessary, samples are submerged with glass rod.

### 9.4.6.3

The effect of each reagent on the individual layers of one chip is compared to that on the corresponding layers of the other chip.

### 9.4.6.4

Observe and record the following qualities which apply.

- Soluble
- Partially soluble
- Pigment leach
- Swell
- Curl
- Discolor
- Soften
- Layer separation
- Gas bubble formation
- Other reactions
- No reaction

### 9.4.6.5

The reactions given by each corresponding layer must be similar. Reactions should be observed immediately, (1) and (3) minutes after reagent is applied.

### 9.4.6.6

Proceed with other reagents as sample quantity permits.

### 9.4.6.7

Be sure to retain sufficient sample for instrumental analysis.

## 9.4.7 References


Castle, D.A. "Pigment Analysis in the Forensic Examination of Paints II. Analysis of Motor Vehicle Paint Pigments by Chemical Tests"; Journal of Forensic Science Society, 1982, 22, 2, 179-186.

Linde, H.G.; Stone, R. P. "Application of the LeRosen Test to Paint Analysis"; Journal of Forensic Science, 1979, 24, 3, 650-655.

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