

**Chromatographic and Spectrographic analysis of sealing wax**  
**Poonam Yadav\* and Kavita Sharma\*\***

Assistant Professor Shri Vaishnav Institute of Forensic Science, SVVV, Indore,  
M.P.

Professor & Coordinator Shri Vaishnav Institute of Forensic Science, SVVV,  
Indore, M.P.

**Abstract**

The use of sealing wax is a common practice in the official routine work of courts, Government offices, police stations, railways and other law enforcement agencies. In a case where tempering is suspected or observed on the related objects then such articles are generally referred to the forensic science laboratory, for the comparison and identification of sealing wax to confirm the tempering. Conventionally physical, chemical and chromatographic examinations are carried out on such articles. In the present study five samples of sealing wax from different sources were examined and compared using Thin layer Chromatography, using a suitable and new solvent system and Infra-red spectrographic analysis. Differences in their fluorescence were also observed under UV light for the fluorescence comparison of the specimen and suspected seal samples. Results so obtained were encouraging and thus can be useful for routine forensic analysis.

**Key words:** Sealing wax, Thin layer Chromatography, spectrographic analysis.

**Introduction**

Wax seals are affixed to letters, documents, envelopes, parcels, containers, railway wagons and other articles to authenticate the contents and to prove the chain of possession.(1) .The use of seals is a standard practice in the official routine of courts, police work, hospitals, railways and other law enforcement agencies. In cases where tampering is suspected these seals on the objects are referred to forensic laboratories for comparison and examination. The chemistry and analytical aspects of shellac chemistry has been reviewed by Bose et *al.* and Rangaswamy and Sen (3,4). Present study deals with TLC and Spectroscopic

analysis for comparison and differentiation of four samples of sealing waxes belonging to different supplier companies.

## **Materials and methods**

### **Extraction**

Four samples of sealing waxes belonging to company suppliers were obtained from the local market of Indore M.P. All these samples were grounded to a fine powder and then subjected to the following extraction procedure.

About 50 mg of the each powder sample (Marked A, B, C&D) was taken in about 20 ml of 95% V/V ethanol and heated for about 15 min on a steam bath. The mixture was filtered while hot through what man No. 1 filter paper. The filtrate so obtained was evaporated almost to dryness and then residues were dissolved in 10 ml of 95% V/V ethanol. This extract was used for TLC examination.

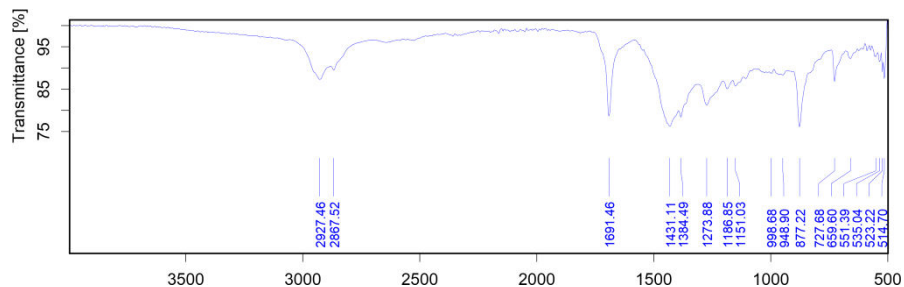
### **Thin-layer chromatography:**

Ethanolic extracts A B C&D were spotted on the TLC plates (20 X 20 cm) coated with a silica gel G and activated at 37 °C for one hour. The plates were developed up to 10 cm using solvent system (Chloroform: Methanol 45:5). After development plates were visualized spraying a reagent with 3% W/V ammonium molybdate in Sulphuric acid and R<sub>f</sub> values were recoded as 0.30, 0.28, 0.28 and 0.29 for samples respectively.

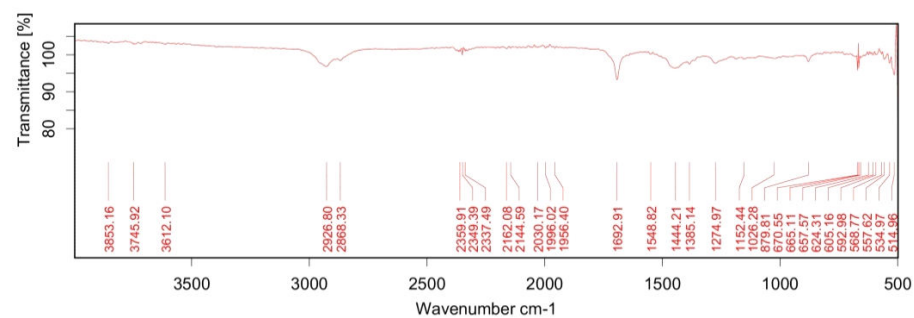
### **Infrared spectroscopic analysis:**

Infrared spectroscopic analysis of sealing wax samples A B C & D was also carried out. IR spectrum so obtained for samples A, B, C& D are as follows. Wave numbers and intensity are tabulated in following Table

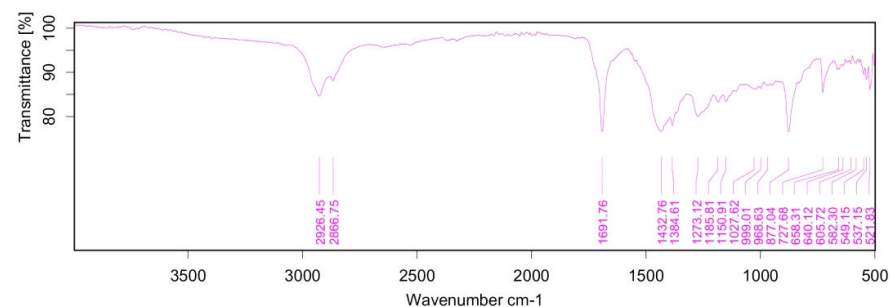
### **IR Spectrum of Sample A , B, C & D**



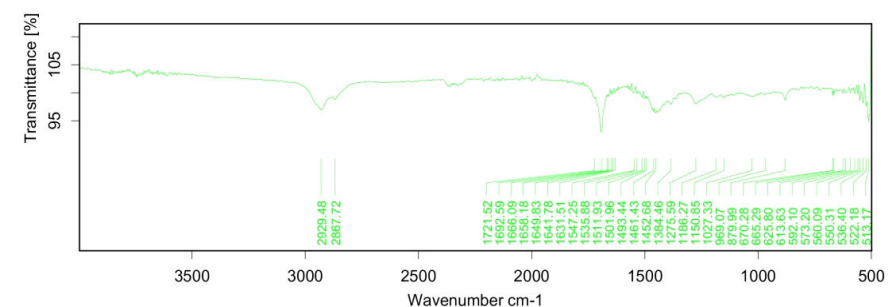
**A**



**B**



**C**



**D**

**Table: Wavenumber Absand Intensity**

<b>Sample A</b>		<b>Sample B</b>		<b>Sample C</b>		<b>Sample D</b>	
Wavenumber Abs.	Intensity	Wavenumber Abs.	Intensity	Wavenumber Abs.	Intensity	Wavenumber Abs.	Intensity
-	-	3853.1572	1.031	-	-	-	-
-	-	3745.9194	1.029	-	-	-	-
-	-	3612.0991	1.028	-	-	-	-
-	-	-	-	-	-	2929.4770	0.970
2927.4569	0.862	-	-	-	-	-	-
-	-	2926.7956	0.968	2926.4538	0.852	-	-
-	-	2868.3314	0.984	-	-	-	-
2867.5220	0.883	-	-	-	-	2867.7235	0.988
-	-	-	-	2866.7522	0.887	-	-
-	-	2359.9114	1.009	-	-	-	-
-	-	2349.3884	0.999	-	-	-	-
-	-	2337.4861	1.010	-	-	-	-
-	-	2162.0753	1.017	-	-	-	-
-	-	2144.5887	1.018	-	-	-	-
-	-	2030.1719	1.020	-	-	-	-
-	-	1996.0233	1.018	-	-	-	-
-	-	1956.4032	1.018	-	-	-	-
-	-	-	-	-	-	1721.5155	0.990
-	-	1692.9085	0.932	-	-	1692.5877	0.929
1691.4578	0.774	-	-	1691.7592	0.766	-	-
-	-	-	-	-	-	1666.0947	0.993
-	-	-	-	-	-	1658.1829	0.993
-	-	-	-	-	-	1649.8316	0.997
-	-	-	-	-	-	1641.7814	0.997
-	-	-	-	-	-	1631.5110	1.000
-	-	1548.8223	1.002	-	-	-	-
-	-	-	-	-	-	1547.2498	0.999
-	-	-	-	-	-	1535.8776	0.999
-	-	-	-	-	-	1511.9253	0.991
-	-	-	-	-	-	1501.9609	0.989
-	-	-	-	-	-	1493.4428	0.990
-	-	-	-	-	-	1461.4310	0.966
-	-	-	-	-	-	1452.6844	0.964
-	-	1444.2077	0.964	-	-	-	-
-	-	-	-	1432.7626	0.771	-	-
1431.1063	0.751	-	-	-	-	-	-
1384.4927	0.772	-	-	1384.6112	0.785	1384.4630	0.979
-	-	1385.1391	0.975	-	-	-	-
-	-	-	-	-	-	1275.5852	0.981
-	-	1274.9683	0.977	-	-	-	-
1273.8831	0.801	-	-	1273.1225	0.805	-	-
1186.8549	0.839	-	-	-	-	-	-
-	-	-	-	-	-	1186.2659	0.992
-	-	-	-	1185.8127	0.839	-	-
-	-	1152.4390	0.988	-	-	-	-
1151.0280	0.846	-	-	-	-	-	-

-	-	-	-	1150.9103	0.840	1150.8496	0.991
-	-	-	-	1027.6159	0.867	1027.3263	0.994
-	-	1026.2801	0.990	-	-	-	-
-	-	-	-	999.0114	0.870	-	-
998.6777	0.876	-	-	-	-	-	-
-	-	-	-	-	-	969.0741	0.997
-	-	-	-	968.6315	0.876	-	-
948.8995	0.872	-	-	-	-	-	-
-	-	879.8149	0.982	-	-	879.9935	0.987
877.2175	0.749	-	-	877.0402	0.765	-	-
727.6775	0.856	-	-	727.6810	0.859	-	-
-	-	670.5528	0.951	-	-	670.2750	0.995
-	-	665.1103	0.959	-	-	665.2932	0.996
659.6016	0.910	-	-	-	-	-	-
-	-	-	-	658.3070	0.912	-	-
-	-	657.5744	0.992	-	-	-	-
-	-	-	-	640.1163	0.920	-	-
-	-	-	-	-	-	625.8044	0.999
-	-	624.3126	1.000	-	-	-	-
-	-	-	-	-	-	613.6274	0.999
-	-	605.1610	1.000	605.7231	0.925	-	-
-	-	592.9790	1.001	-	-	592.0971	0.999
-	-	-	-	582.2962	0.925	-	-
-	-	-	-	-	-	573.2031	0.998
-	-	568.7703	1.002	-	-	-	-
-	-	-	-	-	-	560.0878	0.997
-	-	557.6233	0.988	-	-	-	-
551.3945	0.915	-	-	-	-	-	-
-	-	-	-	-	-	550.3096	0.987
-	-	-	-	549.1532	0.900	-	-
-	-	-	-	537.1538	0.888	-	-
-	-	-	-	-	-	536.4035	0.981
535.0398	0.903	-	-	-	-	-	-
-	-	534.9668	0.977	-	-	-	-
523.2203	0.879	-	-	-	-	-	-
-	-	-	-	-	-	522.1771	0.975
-	-	-	-	521.8340	0.865	-	-
514.7026	0.862	514.9563	0.945	-	-	-	-
-	-	-	-	-	-	513.1688	0.948

## Result and discussion

On the basis of TLC examination of sealing waxes conclusive result could be obtained so the samples were subjected to Infra-red spectroscopic examination. IR spectrum of these samples clearly distinguished the samples. Therefore in cases where tampering is suspected or comparison of sealing waxes has to be carried Infra-red spectroscopic analysis found to be useful and suitable.

## **References**

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