A spiritless shellac polish for wooden furniture

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USE of lac for the finishing of wooden furniture and floor is known from the very early times. In this field it is used in the form of spirit solution which, when applied properly produces a hard, smooth, highly glossy and attractive finish. In addition the above solution is also used for polishing of radio and television cabinets, musical instruments, sports goods, wooden toys, linoleum etc. to add beauty and charm to them.

Till the other day, shellac was considered as the finest finish for wood. Consumers through-out the world could not think of any other finish for wood. It actually enjoyed a monopoly in this field. But with the advent of synthetic wood lacquers, the pre-eminence of shellac has been greately threatened. It has already largely been replaced by synthetic wood lacquers in overseas countries.

In India however shellac is still the most favourite and very widely used wood finishing material. This is because of the fact that in this country the cost of labour has not gone so high and also lac is still available at a comparatively much cheaper rate.

It has been estimated that our internal consumption of lac is of the tune of 3,500 tons out of which 2,000 tons are consumed in French Polishing industry alone.

In recent years the sudden acute shortage of alcohol in the country has badly affected this trade.

Alternate solvents and solvent mixtures were, therefore examined but none of them could compare with the cost of spirit and as such could not become popular.

Only recently National Organic Chemical Industries limited has brought out in the market three commercial solvents which are the mixtures of isopropanol, acetone and water. The exact compositions of the mixtures are given below.

Trade of the solvent	*Composition*
1. IPA—CBM	88.5% Crude isopropyl alcohol + 11.5 Water
2. IPA—XA	50% IPA — CBM + 50% Acetone
3. IPA—X	23% IPA — CBM + 77% Acetone

All the above solvents are easily available and cheaper than spirit and therefore, they were studied thoroughly as a substitute for methylated spirit in the preparation of shellac and modified shellac varnishes.

Solubility of lac

Solubility of different varieties of lac in the above solvents was studied by dissolving 50 g. of powdered lac (20 mesh) in 150 g. of the solvent under constant shaking in a wrist shaker. It was noted that solvent No. 1 took comparatively longer time for the dissolution of lac than the other two solvents.

All varieties of lac dissolved freely in the above solvents giving homogeneous varnishes. Dewaxed varieties of lac produced clear transparent varnishes while wax containing shellacs gave cloudy solutions. The exact time taken by each solvent to dissolve 50g. of lac is given in Table No. 1.

Viscosity

Viscosity of the above solutions was determined at 30°C by No. 4, Ford cup. It was observed that solvent No. 1 produced the thickest varnish and solvent No. 3 gave the thinnest varnish with the same solids. The data are brought out in Table No. 1.

Film forming characteristics

Films on glass and tin panels were prepared by flowing and on wood panels by French polishing. All the solvents produced uniform, smooth & glossy films on tin and glass plates. On wood, however, solvents 2 and 3 left some fine streaks due to their quick rate of evaporation. As regards the smoothness and gloss on wood panels solvents No. 1 served the best.

Drying characteristics

Drying characteristics of films prepared from all these solvents and alcohol were studied by preparing the films on tin panels and noting the extent of drying at regular intervals of time. It was found that films from solvents 2 & 3 became tack free within 10 mins. while in the case of solvent No. 1 it took about 20 mins. to become tack free. After 2 hours all the films showed nail hardness.

Mechanical properties

Mechanical properties such as hardness, flexibility and impact resistance, of air dried films were determined by the standard methods prescribed in ISS 101/1964. It was found that as regard to above properties all the solvents behaved practically alike and compared favourably with the films obtained from spirit solution. The data are brought out in Table No. 1.

Water resistance

Water resistance of the films was studied by immersing the films in distilled water and noting the extent of blushing or film failure at different intervals of time. It was observed that in this property solvent No. 1 gave better performance than No. 2 & No. 3 and compared favourably with the films produced from spirit solution.

Heat resistance

Heat resistance of the films was tested on French polished wooden panels by placing a (600 cc) beaker containing hot water at increasing temperatures at steps of 2°C beginning from 60°C for 2 minutes and noting the extent of marking or sticking, if any, at each temperature.

It was observed that solvents 2 and 3 showed somewhat better resistance to heat than solvent No. 1. However the difference was not appreciable. The data are summarised in Table No. 1.

Solvent resistance

Resistance of film to solvents like alcohol, acetone toluene, white spirit etc. was studied. In the case of acetone, and alcohol resistance hard rub method was adopted while in the case of other solvents dip method was followed.

It was observed that all the films behaved practically alike.

Acid and Alkali resistance

Resistance of the films to dilute hydrochloric acid and dilute sodium hydroxide was also studied. Standard methods of tests as prescribed in ISS 520/1954 were followed.

It was seen that all the films resisted acid immersion test while in regard to alkali resistance dissolution of films took place within two minutes. In this property also all the solvents behaved alike.

Suitability of these solvents for French polish & other modified shellac varnishes

It may be seen that all the three solvents dissolve lac freely to give satisfactory varnishes, but for the French polishing of furniture solvent No. 1 serves the best as it produces hard, smooth, highly glossy finish. On the other hand solvents No. 2 & 3 leave some fine streaks on the surface due to improper levelling. Further the solvents 2 & 3 produce toxic vapours during French polishing.

Keeping all the above facts in view solvent No. 1 can satisfactorily be used as a substitute for spirit in the preparation of French polish.

Preliminary experiments have shown that solvent No. 1 can also be used for the preparation of Melfolac[1] & tin plate lacquer[2] developed earlier at this institute.

Suitability of these solvents for synthetic resins & Plasticizers

Solubility of synthetic resins in these solvents was also studied and it was found that most of the synthetics such as urea-formaldehyde melamine-formaldehyde, phenol-formaldehyde resins, maleic resin : dissolved freely in all the three solvents. However, epoxy resins dissolved in solvents 2 & 3 only.

Solutions of the above synthetic resins were found to be compatible with shellac varnishes in all proportions giving clear varnishes.

Plasticizers such as dibutyl phthalate, tricresyl phosphate, sextol phthalate, etc. were also found to dissolve in these solvents freely.

Prospects of these solvents in shellac industry

In view of their good solvent power for shellac and most of the synthetics these commercial solvents have a very promising future in shellac industry. It is expected that besides French polishing the use of these

Table 1

COMPARATIVE FILM PERFORMANCE OF SHELLAC VARNISHES PREPARED FROM THE FOLLOWING SOLVENTS

Sl. No. Properties	*IPA—CBM No. 1*	*IPA—X No. 2*	*IPA—XA No. 3*	*Spirit No. 4*
A. Properties of the varnish				
1. Time taken to dissolve 50 gms. shellac in 150 g. of the solvent.	150	60	60	60
2. Clarity of the varnish	Clear and transparent	Clear and transparent	Clear and transparent	Clear and transparent
3. Viscosity (No. 4 Fordcup at 30°C) —time in seconds	21.4	14.4	14.2	17.2
B. Drying characteristics				
1. Dust dry-time in mts.	5	3	2	2
2. Tack free-time in mts.	20	10	10	10
3. Hard dry-time in hours	24	24	24	24
C. Properties of the films				
1. Appearance of the film	Hard, smooth & glossy	Hard, smooth & glossy	Hard, smooth & glossy	Hard, smooth & glossy
2. Scratch hardness — load on imms. ball	600	900	700	500
3. Flexibility on 1/8″ mandrel	VFC	FC	FC	FC
D. Water resistance				
1. Initial time of blushing in mts.	100	45	45	45
2. Condition of the film after 48 hours immersion	BB	BB	BB	BB
3. Recovery	Complete in 40 minutes	Complete in one hour	Complete in one hour	Complete in one hour
E. Heat resistance				
1. Initial sticking temp.	68°C	70°C	72°C	69°C
2. Condition of the film on keeping boiling water beaker for 2 mts.	Sticks	Sticks	Sticks	Sticks
F. Alcohol resistance number of hard rubs	10	11	10	10

(Table 1 continued)

Sl. No.	Properties	IPA—CBM No. 1	IPA—X No. 2	IPA—XA No. 3	Spririt No. 4
G.	Acetone resistance number of hard rubs	11	13	15	15
H.	Acid resistance 5% HCl solution	NE	NE	NE	NE
I.	Resistance to 1% NaOH solution	FD 2 mts.	FD 2 mts.	FD 2 mts.	FD 2 mts.
J.	Resistance to toluene di- method	NE	NE	NE	NE
K.	Resistance to lubricating oil one hour at 50°C.	NE	NE	NE	NE
L.	Resistance to white spirit — 24 hours immersion	NE	NE	NE	NE

BB=Bad blushing NE=No effect FD=Film dissolved FC=Fine cracks VFC=Very fine cracks

solvents can be extended in other shellac based compositions such as paper varnish, picture varnish, tin plate lacquers, lac epoxy varnishes flexographic inks, vehicle for quick drying paints, coloured lacquers for aluminium foils etc.

Solvents 2 & 3 may also be evaluated for dewaxing of shellac and also in the preparation of shellac and dewaxed shellacs directly from sticklac by precipitation method developed earlier at this Institute.

References

1. Shravan Kumar — Paint Technology Vol. 30, No. 2, (1966) P. 16.
2. Shravan Kumar — Paintindia Vol. 15, No. 7, (1965), p. 22.

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