

## Lac-based Adhesive (Glue) for Paper

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A suitable adhesive composition, based on aqueous alkaline solutions of seedlac/shellac and hydrolysed lac, for pasting paper to paper and paper to other surfaces such as glass, metal, plastic container, wood, and cloth has been developed.

Shellac has been used as an adhesive since ancient times. It is also used as a bonding agent for various substrates because of its remarkable adhesion to a variety of surfaces, particularly glass, mica, glazed porcelain, polished metal, etc. However, its adhesive properties on paper to paper and paper to other surfaces has not been studied in detail. A composition<sup>1</sup> comprising shellac, hydrolysed lac and polyethylene glycol has been found to be suitable for binding paper and leather. Another composition<sup>2</sup> consisting of an ammoniacal solution of lac has also been found to serve as an adhesive for pasting labels on glass bottles. The water resistance property of this adhesive composition was found to be better than casein, polyvinyl acetate or polyvinyl alcohol. All these compositions are, however, covered by patents. In the present study, an attempt has been made to prepare lac based glue for paper. The results obtained are quite comparable to that specified in IS:2257-1970 except pH, which, in the present case, was found to be slightly on the higher side (pH—8.0).

### Experimental procedures

Following compositions were tried: (figures in parts): 1. Seedlac-25.0, hydrolysed lac-2.5, borax-7.0, water-100.0; 2. seedlac-25.0, hydrolysed lac-2.5, triethanolamine-4.0, water-70.0; 3. seedlac-25.0, hydrolysed lac-2.5, ammonia-5.0, water-95.0; 4. seedlac-30.0,

hydrolysed lac-3.0, sodium carbonate-3.5, water-100.0; 5. seedlac-30.0, sodium carbonate-3.0, sodium hydroxide-0.3, water-100.0.

*Preparation of the glue*—Seedlac and hydrolysed lac were added to the alkaline solution previously heated to 70°-80°C and the heating was continued till it went into solution. The solution was then filtered through muslin cloth in hot condition to remove impurities and cooled. One of the following preservatives is added to cooled solution: spirit, formalin, sodium benzoate, copper sulphate.

The performance of the glues thus prepared was evaluated using different qualities of paper on different surfaces:

Paper	Surfaces
(a) Writing paper	(a) Same surface
(b) Type paper	(b) Different paper
(c) Kraft paper	(c) Glass
(d) Coated art paper	(d) G.I. sheet
(e) Cartridge paper	(e) Wood packing
(f) Cr laid paper	(f) Muslin cloth

The lac-based glue was then subjected to the following tests as laid down in IS:2257-1970.

*Adhesion test*—Six pieces of paper of size 5 × 6 cm each were taken. On each piece the adhesive was so applied by spreading with glass rod that it covers an area of 5 × 5 cm, thus leaving

an uncoated flap of 1 cm, width. Paper was then fixed on each of the coated surfaces and kept at room temperature for 1 hr. The 1-cm-wide flap was then folded and torn. If the piece of paper teared off during pulling leaving at least 50 per cent of the fibres on the surface, the adhesion was satisfactory and passed the test.

**Brittleness test of the dried film**—A kraft paper  $2.5 \times 10$  cm in size was taken and a thick film of the adhesive was coated over the glazed side of the paper; the coated paper was kept at room temperature for 1 hr. An office-ruler (diam. 2.5 cm) was rolled over the coated side first and then over the uncoated side. The film did not show any sign of cracking.

**Storage stability test**—The adhesive was stored in different, tightly closed glass/plastic containers. It was observed that the adhesive did not show any sign of jungle growth on its surface and sedimentation of the resin, and any deterioration in its adhesive property for 2 years.

**Results and discussion**—The adhesion of lac in triethanolamine and sodium carbonate solutions on paper to paper and paper to other surfaces was better than that of lac in ammoniacal and borax solutions. It was found that ammoniacal solution had poor storage life. In the case of

borax, the lac dye percolates through paper and comes out at the upper surface, thereby making the paper coloured. The performance of the aqueous solution of seedlac/shellac in sodium carbonate and triethanolamine was also found to be better as it has passed all the standard tests. Since sodium carbonate is cheaper than triethanolamine, it is preferred for making the glue. The role of hydrolysed lac is sufficient to achieve the desired results. In the fifth composition, it was observed that hydrolysed lac could be replaced by addition of calculated amount of sodium hydroxide to hydrolyse the lac molecule to the desired extent. The performance of this composition was found to be similar to that observed in the case of fourth composition.

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#### References

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