

## Copal Resin

*(from "Pitman's Common Commodities and Industries, GUMS & RESINS – by Ernest J. Parry, London; Printed by Sir Isaac Pitman & Sons, Ltd, Bath, England, v-(1465E))*

Copal resin, or gum copal, as it is frequently termed in commerce, comprises a number of different types of resin, some of recent, others of fossil origin, and to some extent found in nearly all tropical and subtropical countries throughout the world. The principal sources of the copal of commerce are East Africa, West Africa, the Dutch East Indies, certain islands in Polynesia, New Zealand, New Caledonia and the north-eastern portions of South America. Generally speaking, five principal types of copal are recognised in commerce, which are as follows –

1. East African copal, including Zanzibar, etc.
2. West African copal
3. Manila copal
4. Kauri copal, from New Zealand and New Caledonia
5. South American Copal

The East African product is collected in British, Portuguese, and (the late) German East Africa, and is usually sent thence to Zanzibar where it is sorted, cleaned and packed for export. It is known as Zanzibar animi or copal, and varies greatly in price, in normal times dust fetching about £ 30 per ton and fine grades over £ 300. The value of the exports from Zanzibar reaches about £ 15,000 per annum. The East African copals are fossil resins, being found principally in localities from which copal trees have disappeared. They are probably the product of species of *Trachylobium*.

The West African copals are obtained along the coastal regions of West Africa from Sierra Leone to the Portuguese Congo. The finer varieties are fossil or semi-fossil, and the poorer grades are derived from living trees. The best varieties are obtained from the Congo, Angola and Benguela; the medium qualities from Sierra Leone and Accra, and the low grades from the Niger districts. The trees which yield or have yielded these types are probably *Copaifera guibourtiana*, *Cyanothyrsus ogea*, and *Daniella oblonga*. They are of far less value than East African copal, the best qualities, in normal times, being worth about £ 75 per ton.

Manila copal was at one time produced entirely in the Philippine Islands, but the same type of resin is now gathered in the Dutch East Indies and comes into commerce under the names Macassar, Pontianac, or Singapore copals. These copals are used for the cheaper, but still good, qualities of copal varnish.

Kauri copal, as the resin from New Zealand and New Caledonia is termed, is a fossil resin derived from the so-called Kauri pine, *Dammara Australis*. The finest varieties fetch about as much as the best East African copal. New Zealand exports about £ 500,000 to £ 600,000 worth of this resin per annum.

South American copal, which is the product of *Hymenoea* species, is derived principally from the living trees, but a certain amount of fossil resin is also collected. Commercially it is known as Demerara animi, and the best grades are worth about half as much as the best East African varieties.

Copal resin varies much in appearance. It is a hard, brittle resin, vitreous and semi-transparent, and yellow to red in colour, often having a peculiar faceted or indented surface, technically known as "goose skin", which is especially characteristic of Zanzibar copal.

The principal virtue of copal resin is its hardness, on account of which copal varnish dries with a good hard surface, able to withstand considerable wear. It is, as is usually the case with the so-called hard "varnish gums", necessary to heat the resin until destructive decomposition sets in, and about 10 to 25 per cent. of its weight is lost in the form of water, gas and oil, before it becomes soluble in linseed oil and turpentine in order to convert it into varnish. The only "adulterants" of copal resin met with in commerce are the cheaper and softer varieties, which are sometimes mixed with the harder and more expensive grades. Common resin has been said to be an adulterant, but this is apocryphal.

Generally speaking, it may be taken for granted that, after allowing for colour, the value of a copal resin depends practically entirely on its hardness. The principal exception to this rule is Kauri copal, which, although it may be of low

melting point, is so easily manipulated by the varnish manufacturer, that it is valued for certain purposes irrespective of its hardness.

The following table represents the general scale of hardness of the principal types of copal known –

1. Zanzibar copal
2. Mozambique copal
3. Lindi copal
4. Red Angola copal
5. Pebble copal
6. Sierra Leone copal (fossil)
7. Yellow Benguela copal
8. White Benguela copal
9. Cameroon copal
10. Congo copal
11. Manila copal
12. White Angola copal
13. Kauri copal
14. Sierra Leone copal (living trees)
15. South American copals

The actual constituents of copal resin are practically unknown. Numerous compounds have been reported as present, but their very high molecular weights, and the absence of characteristic derivatives, render the published details very dubious, and they must be accepted with reserve. For example, Tschirch and Stephan claim to have isolated from Zanzibar copal, about 80 per cent. of trachyloic acid, of the formula  $654H85O3(OH)(COOH)_2$ , and other similar compounds. The author can find little evidence beyond the percentage results of an organic combustion, to support these formulae. It is however, certain, that all copals consist, like shellac, of a mixture of which the principal constituents are free acids and esters, and the determination of the acid and ester values gives useful information as to the purity and type of the resin examined. The following figures, which must not be considered exhaustive, have been found to cover the types of copal resin mentioned –

	Acid value	Ester value
Manila	120 to 130	45 to 55
Singapore	120 to 135	50 to 65
Kauri	65 to 85	30 to 40
Angola	50 to 90	50 to 80

The iodine value has also been determined on a number of samples and varies as follows according to Worstoll –

Kauri	74 to 170
Manila	104 to 148
Pontianac	119 to 142
Zanzibar	115 to 123
Mozambique	136
Madagascar	126
West African	122 to 143
Sierra Leone	102 to 105
Brazilian	123 to 134