# Wood Protectant from Coconut Shell: New Biobased Product for a Safe Future

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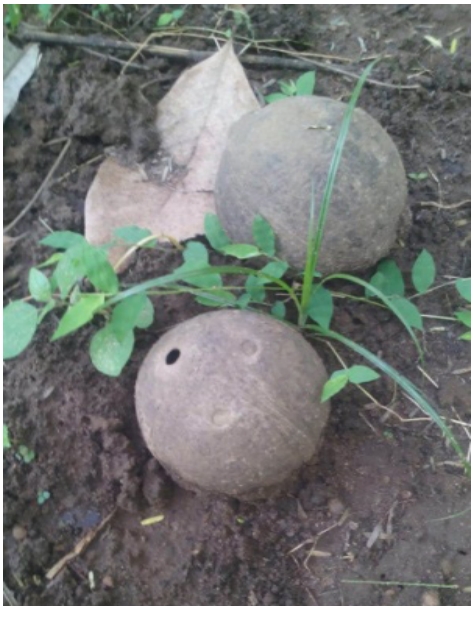
## Long lasting coconut shell

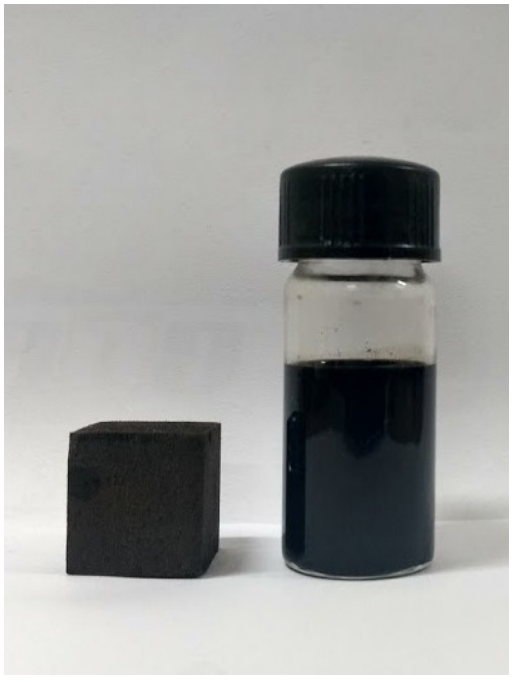
Have you ever noticed shells of coconut surviving the test of time? Have you ever wondered why the coconut shells remain intact in soil, long after it's thrown out? When I came across a piece of coconut shell in my garden withstanding the adverse effects of weather and attack of microorganisms, long after it was discarded, I pondered on the reason. When all other biological materials like leaves, wood and kitchen wastes disappeared in no time what makes coconut shell unique. What could be the reason behind it? What makes it so much durable? There is surely something which is protecting it from biodeterioration.



## Coconut shell oil to protect wood

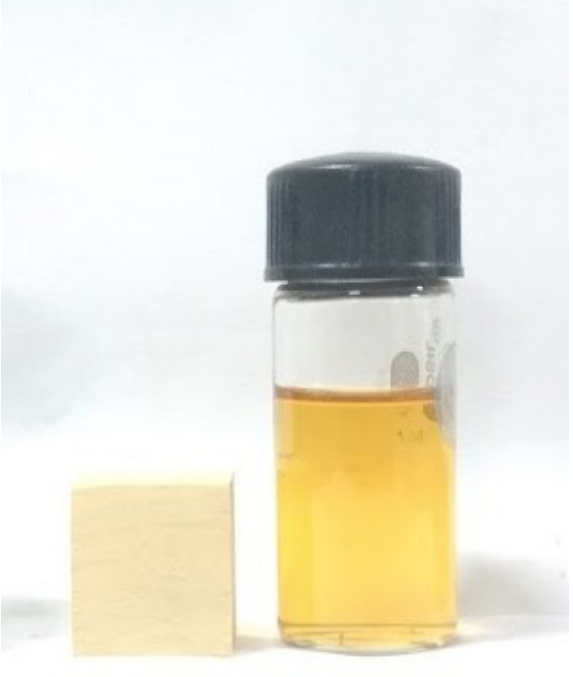
Being a Keralite whose life revolves around coconut, it came naturally to me that if I can utilize this property of coconut shell to develop a wood preservative it will definitely be a boon to the wood industry as the wood science researchers are under pressure to find a biobased wood preservative to replace

* Dr. Shiny K S, Post Doctoral Fellow from Institute of Wood Science and Technology, Bangalore, is pursuing her research on "Wood Preservation." Her popular science story entitled "Wood Protectant from Coconut Shell: New Biobased Product for a Safe Future" has been selected for AWSAR Award.



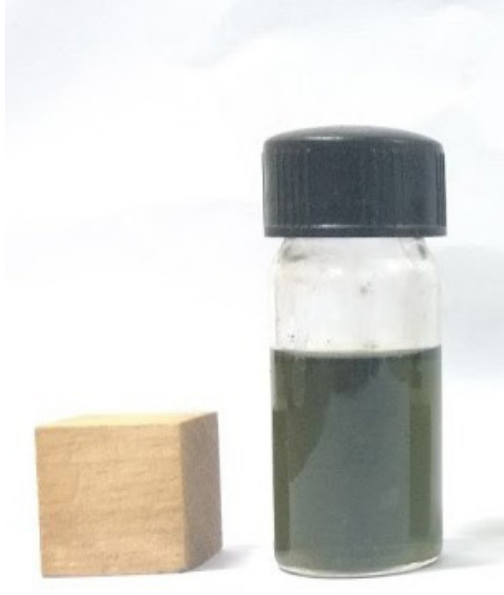
the chemicals currently in use. Coconuts are the most auspicious among edible fruits with multiple utilities and products made from its kernel. Coconut shells are usually thrown out from kitchen though a few use them to burn as fuel for cooking. The shells are not eaten by insects or decayed by microbes and remain intact for a very long time. This was the thought behind the Post Doctoral project proposal which I submitted to KSCSTE, Govt. of Kerala, and I was fortunate to receive funding for the proposal.

The idea behind the proposal was to find out whether coconut shell oil can be used as a wood preservative. Coconut shell oil is produced as a result of pyrolysis of coconut shell i.e., burning the coconut shells under no or limited supply of air. Coconut shell oil is a bye-product of charcoal industry, so utilization of coconut shell oil as a wood preservative will be a value addition by increasing income sources of such industries. A good wood protectant should protect wood from all wood deteriorating organisms like termites, wood decay fungi and wood borers. A set of standard procedures as prescribed by Bureau of Indian Standards, termites (IS 4833), decay fungi (IS 4873 Part-I) and wood borers (IS 4873 Part-II) were employed to test the effectiveness of coconut shell oil as a wood preservative. Treatment methods adopted were brush coating, dipping and pressure impregnation. The results indicated that coconut shell oil could impart significant level of protection to the treated wood blocks against termites, decay fungi wood borers. But the disadvantage of coconut shell oil was that, due to its dark colour and viscous nature it can be recommended only for outdoor applications.



I decided to improve the nature and efficiency of coconut shell oil so that I can recommend it for indoor applications also. I prepared a proposal with this in mind and got funding from DST under the Fast Track Scheme for Young Scientists. Improving Coconut shell oil to pick up its aesthetic value and efficacy as a wood protectant was the subject matter of the proposed work. I wanted to modify the texture and colour of the coconut shell oil and it was a big task due to its tar like consistency. Coconut shell oil was subjected to separation techniques like extraction, fractionation and dialysis. Finally I managed to get different fractions of coconut shell oil like water extract of coconut shell oil, dialysate of coconut shell oil, distillate of coconut shell oil and steam distillate of coconut shell oil. All these fractions were colour less which was one of my requirements for the intended use. Now I wanted to test how efficient these fractions were in protecting the wood. Standard procedures of Bureau of Indian Standards were followed and distillate of coconut shell oil gave best results. I wondered what gives distillate of coconut shell oil the efficiency to protect wood. Hence, I analyzed the composition of this colour less distillate using gas chromatography– mass spectroscopy technique, and found that it essentially comprises phenol and phenolic compounds.

## Marketable product and a patent right



The efficiency of the distillate of coconut shell oil had to be improved to get a commercially feasible biobased formulation for wood protection. As of now, all the products available in market for wood protection are salts of inorganic ions like copper, zinc and boron. So to improve the efficiency of distillate of coconut shell oil, copper, zinc and boron ions were incorporated by refluxing the solution with their respective salts. The resultant formulations were again tested for their efficiency as wood preservative using Standard procedures of Bureau of Indian Standards. The results showed that, the formulation of copper ions and distillate of coconut shell oil gave best results protecting the wood from termites in the field for three years. It also gave protection to the treated wood against the attack of wood decay fungi and wood borers. I published the results of the studies in reputed international journals with good impact factor and presented my work in various international and national conferences. The outcome of the study gave me confidence to file a patent for the formulation I developed from coconut shell oil as - Ecofriendly wood protectant from coconut shell oil.

## Protect and conserve wood

The objective of wood protection is to preserve and prolong the life of non-durable wood. Wood protection is mainly the art of preserving non-durable timbers against the agents of degradation. Preservative treatment reduces the pressure on more naturally durable, rare and higher value species. Protective treatment of timber, therefore, forms a very important part of the national effort to conserve the material resources. If protected from fire, insect and fungal attack, timber structures can survive for extremely long periods may be 2000 years or more. The long lifespan of timber, in particular, can substantially reduce the depletion of forest resources.

## Protecting timber is a global need to mitigate climate change

Timber formed by the trees is the major sinks of carbon and known to sequester carbon for long time. Increased carbon emission is the major reason for the climate change. Utilization of protected wood is one of the simplest, most effective and best ways to store carbon and mitigate the carbon emission. Removing the carbon and storing it for a long time is a global need to mitigate climate change. Wood, the natural renewable material has the capacity to do both. By wood preservation we are increasing the service life of wood, thereby reducing the adverse effects of climate change indirectly.

## New biobased product for safe future

Current scenario in the wood protection research is not promising. After the phasing out of chemical wood preservatives like Chromated Copper Arsenate (CCA) due to environmental concerns, scientists have not come across any good quality wood protectant that protects wood under both indoor and outdoor conditions. All the commercially available wood preservatives that give good results are of chemical origin. Wood is to be protected with environmentally friendly, naturally renewable substances, so that the treated wood is fit for the purpose, has a safe life cycle and eventual disposal. In this context, the prospects of coconut shell oil formulation as an effective biobased wood preservative holds good, as coconut shell is an abundant, cheap and renewable bio resource. It is now up to the entrepreneurs and industries to produce and market this technology for the benefit of the society. It is a clarion call to all those nature lovers and environmentalists to come forward and use this technology to ensure a safe future for all.