

Camphor and Pinene

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Camphor wood was once used to make moth repellent chests for storing linen sheets. Those times have gone, but Camphor wood chips can still be found in rural markets in Northern Thailand. *What might they be used for?* That seems to be a chemical question.



Camphor laurel trees can still be found in SE Asia from Thailand to Hong Kong.

Image: https://commons.wikimedia.org/wiki/File:Camphor_Grove_Sha_Tau_Kok.jpg

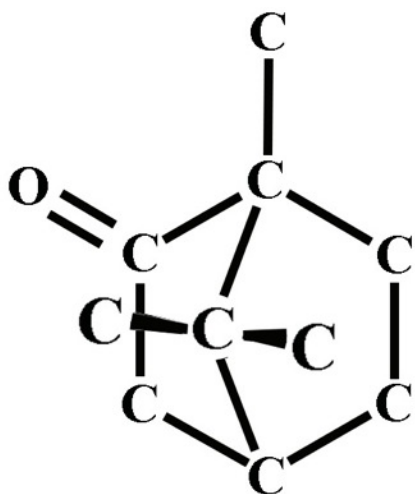
Three years back at an Aka market, on the road between Taton and Chiang Rai, I watched my mother buying a bundle of shattered broken wood that looked like the remains of a tree struck by lightning. She said it was for lighting fires. That didn't seem sensible but I knew not to say anything.

We still have chips of that wood. Ever time we have a charcoal barbecue we use one to light the fire and when we visit friends for a barbecue we take one with us. I was right not to say anything. The wood is so easy to light. It burns like a match, but for much longer with a hot sooty flame like turpentine, and lights charcoal every time.

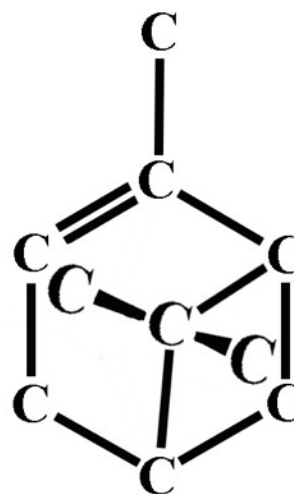
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Essential oils like *Citronella* from Lemongrass are steam distilled from the raw material. A hay-bale size pile of lemon grass produces a little bottle of oil. Distilling pine wood for turpentine and laurel wood for camphor is more rewarding.

Fresh pine and camphor wood contains up to 5% terpenes: aromatic organic compounds with complex carbon ring structures. Camphor is a crystalline waxy substance that burns like turpentine. It's a terpene with a ring structure like alpha-pinene, the principle component of the pine distillate sold as Turpentine: an organic solvent, a non oil-based paint thinner.



The structure of camphor $C_{10}H_{16}O$. Sixteen hydrogens are bonded to the carbons.



The structure of alpha-pinene $C_{10}H_{16}$. Sixteen hydrogens are bonded to the carbons.

Because so many trees have been cut down camphor wood is in short supply and most camphor is now synthesised from pinene.

Camphor is popular in Thailand as perfume for houses and handbags.



Pure camphor is sold in Pharmacies to be used in skin lotions and as an air freshener.



Turpentine is a cheap oil used for many years as a solvent. My father remembers his father washing his hands in turpentine to remove tar with which painted his posts and wooden gates.

Fast growing pine trees are farmed in temperate countries. The wood is used to make paper and building materials and is in plentiful supply.

Turpentine remains a cheap solvent and can be bought in any paint shop. In Thailand it's sold in Leo bottles.

It is not recommended as a drink of any kind.

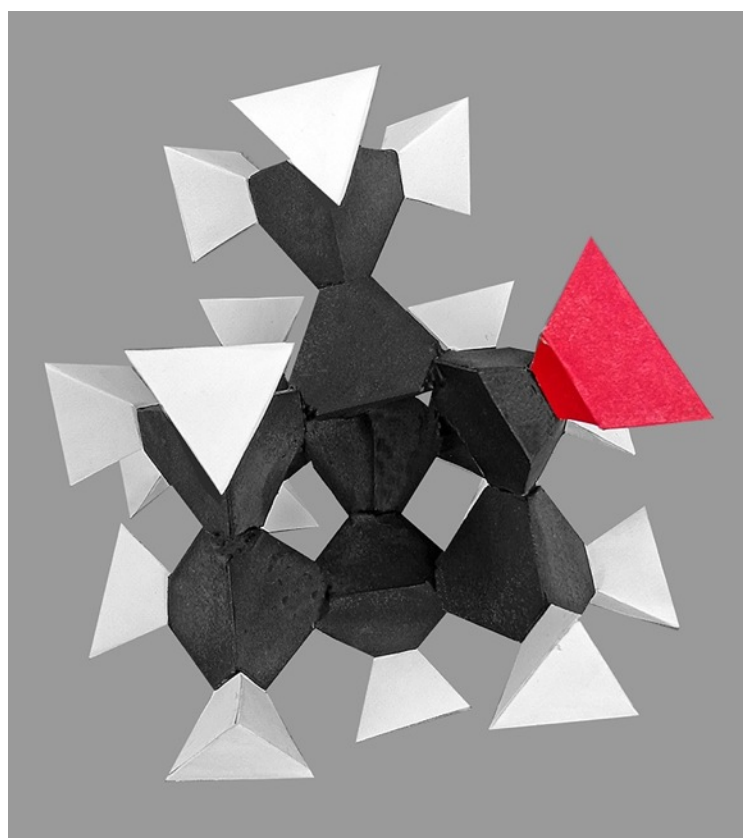


The bag and the bottle cost 40 Bhat each.

The ring structure of these compounds is more challenging to model in paper than anything we've done before. Cyclohexane and benzene have no "bond strain", so the right snub points on our models fit flat against each other. Because the ring structure of these compounds is a hexagonal carbon ring with a carbon bridge, some of the bond angles are slightly bent ... (strained a little).

Camphor

A paper model of a camphor molecule.



The bridge carbon is behind the ring of six with its two methyl groups $2(\text{CH}_3)$. It is not possible to examine all the features of this model in a 2D image. For a stereo pair see ...

https://www.flickr.com/photos/jacobs_ian/52086570025/in/photostream

The double $\text{C} = \text{O}$ bond makes this a terpene *ketone*. Ketones and aldehydes are important classes of organic compounds and will be modelled in a future article.

Alpha-pinene

Alpha-pinene is the most abundant terpene in Turpentine and is the starting material for the commercial synthesis of Camphor.



The carbon bridge is behind the ring of six with two obscured CH_3 groups. Note a double $\text{C} = \text{C}$ bond upper right and a cyclobutane ring of four carbons centre left that has significant bond strain.



We first made a ring of four carbons and added a three carbon chain, $\text{C} = \text{C} - \text{C}$, and CH_3 groups. The construction aid is linked below.

Smoky flame confirmation

Camphor wood.



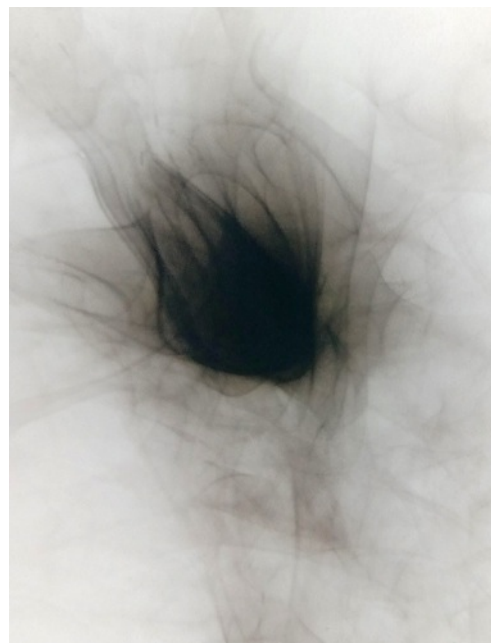
Pure camphor.



Turpentine on a wick.



Lamp black: unburnt carbon is deposited on paper held over any one of these flames for five seconds.



A thin stream of unburnt carbon rises from the tip of the flame accompanied by a smell of camphor or turpentine.