Of Charcoal and Ashes (part 1).

By Elska Fjarfell from the Dominion of Myrkfaelinn, 2015

Charcoal is formed by the incomplete burn, or combustion, of wood. Made of mostly cellulose wood does not burn immediately, first it releases steam and turns from white to black; it chars, thus becoming charcoal. When charcoal burns in contact with air, its carbon combines with oxygen to form the gas carbon dioxide (and lots of heat). The white ash leftover from burning charcoal is what remains of the small amount of non-flammable minerals which were present in the wood from the start.

> The charring of cellulose: Cellulose (CH_2O) in combustion forms Carbon (C) and water (H_2O)
> The combustion of charcoal: Carbon (C) heated with Oxygen (O_2) forms Carbon Dioxide (CO_2)

As different varieties of wood grown on different soils have different compositions, ash will also have a variable composition, something to keep in mind when using ashes to leach lye. The part of ash that can dissolve in water and be leached out is called potash, or potassium carbonate. But potash is not the only soluble component, and depending on soil conditions, sodium carbonate might also be present. Along the seashore, and especially when burning marine plants there may be more sodium carbonate than potassium carbonate present and this product is called soda ash. Sodium sulfates and potassium sulfates can also be present, and for the proper making of lye for soap, these contaminants should to be removed as they can interfere with the saponification process.

Potash and soda ash can be crystallized by evaporating water from the leached alkaline solution. As potassium carbonate (147g/100ml) is highly soluble compared to sodium sulfate (11g/100ml), potassium sulfate (12g/100ml) and sodium carbonates (22g/100ml) the contaminants will crystallize out of solution first. If the alkaline solution is left alone for a while the less soluble compounds crystallize out and will sink to the bottom while the potassium carbonate will stay in solution as long as possible. Pour off this solution to leave these crystals behind and the lye thus made will have less contaminants.

When wood is burned without the presence of oxygen (anaerobic) it turns black as the water is evaporated out, leaving charcoal behind. If access to air is limited and heat is removed, the charcoal will become stable and available for future use. Charcoal takes up less space and is able reach a higher temperature with the addition of extra air (bellows) than a pile of wood, which makes it ideal for use in a smithy's furnace. To make proper charcoal an anaerobic burn is necessary, and in history people have found different ways of doing so, mostly by either digging in wood in hill sides or covering wood with a burn resistant material (like a metal kettle) while building a large fire right over it.

A side note:
The burning of marine plants creates sodium carbonate rich ashes. At the sea shore where seaweed is available in abundance making soda ash is not much different from making potash. But it's a challenge for the small scale experimental soap maker as the goal is pure seaweed ashes, without potassium carbonate (land based plants) contamination. As seaweed does not burn easily on its own, unlike wood, a way around this is to first make seaweed charcoal, which does burn, and then burn it to ashes, with plenty of air for complete combustion to create fine white ashes for the lye leaching vat.

The Making of Charcoal – a step by step photo essay.

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Start your fire.

Use a new empty paint can, make sure it has a handle when you buy it.

Poke a hole in the lid with a framing nail.

Fill the cans with the type of material you'd like to char: willow for gunpowder, grapevine for artist charcoal, seaweed for soda ashes etc.

Place lid on can tightly.

Place your can close to the fire. This is the tricky bit, too close and the evaporated water (steam) inside the canister can not leave fast enough out of the tiny hole and will build enough pressure to blow off the lid, exposing your materials to oxygen. Too far away and the burn will take fooorever.

A good burn will have a steady steam of smoke, like a chimney.

If the smoke comes out in a stiff pillar and/or the lid starts whistling there is likely pressure building up – gently move the can a little away from the heat.
If smoke is coming out in puffs and starts, either the can is too cold (gently move closer to the fire) or the hole in the lid is gummed up (use nail to poke open hole).

After a long time, the smoke will start to peter out, as you can see at the left canister. Do not mess with the can as now it is time for the flame to appear. Make sure the fire is well built at this point to help the combustible gasses to ignite.

When the flame starts to diminish keep a good eye on the canister: the moment it goes out, remove the can from the fire and plug the hole.

I find a bamboo skewer to work well, but any twig will do, as long as during cool down NO air can come in.

The result: beautiful charcoal sticks for drawing.

Some things to keep in mind:

The burn time differs for the type of wood used and if the wood is already dry or freshly packed. Bedwyr of Myrkfaelinn, who taught me this technique, uses dried willow and manages a successful burn on a relaxing Pennsic evening. When charring seaweed and fresh grapevines it took me about 6 hours (and 20+ mostly hardwood pallets). The timing of the seaweed and the grapevines was about the same, apparently densely packed leathery leaves, even though dried and salted, evaporate at about the same rate as fresh, but thin, sticks.

Comparing notes with Bedwyr it seems that he has a shorter evaporation burn (about 2 hours) but a longer combustibles burn (30min to 1 hour). Both times I did a charcoal burn at my place the initial evaporation burn took long (4-5 hours) but the combustibles burn was very quick (10min) – keep this in mind while doing your own burn as not to miss the perfect time to plug the lid.

The liner of the paint can will char and flake as well. Keep in mind when removing your precious charcoal from the can that those flakes should be removed as they are contaminants.

Do not open the can indoors. There are noxious fumes in there you really do not want to breath in.

For a more medieval way of making small amounts of charcoal I wonder if a Dutch oven with a tight fitting lid would work just as well. I can see how the steam can evaporate from under the lid, but the question is, how do the combustibles burn off, and will air be sucked in under said lid during cool down?

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