

# Wood ash

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**Wood ash** is the residue powder left after the combustion of wood, such as burning wood in a home fireplace or an industrial power plant. It is used traditionally by gardeners as a good source of potash.



Wood ash from a campfire

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## Composition

### Variability in assessment

Many studies have been conducted regarding the chemical composition of wood ash, with widely varying results. Some quote calcium carbonate ( $\text{CaCO}_3$ ) as the major constituent,<sup>[1]</sup> others find no carbonate at all, but calcium oxide ( $\text{CaO}$ ) instead.<sup>[2]</sup> Some show as much as twelve percent iron oxide<sup>[2]</sup> while others show none,<sup>[3]</sup> though iron oxide is often introduced through contamination with soil. A comprehensive set of analyses of wood ash composition from many tree species has been carried out by Emil Wolff,<sup>[4]</sup> among others.

Several factors have a major impact on the composition:

1. Fly ash: Some studies include the solids escaping via the flue during combustion, while others do not.
2. Temperature of combustion<sup>[5]</sup> produces two direct effects:
  - Dissociation: Conversion of carbonates, sulfides, etc., to oxides results in no carbon, sulfur, carbonates, or sulfides. Some metallic oxides (e.g. mercuric oxide) even dissociate to their elemental state and/or vaporize completely at wood fire temperatures.

- Volatilization: In studies in which the fly ash is not measured, some combustion products may not be present at all.
3. Experimental process: If the ashes are exposed to the environment between combustion and the analysis, oxides may convert back to carbonates by reacting with carbon dioxide in the air.
  4. Type, age, and growing environment of the wood stock affect the composition of the wood, and thus the ash.

## Measurements

Typically between 0.43 and 1.82 percent of the mass of burned wood (dry basis) results in ash.<sup>[5]</sup> Also the conditions of the combustion affect the composition and amount of the residue ash, thus higher temperature will reduce ash yield.<sup>[3]</sup>

Much wood ash contains calcium carbonate as its major component, representing 25<sup>[6]</sup> or even 45 percent.<sup>[1]</sup> Less than 10 percent is potash, and less than 1 percent phosphate; there are trace elements of iron, manganese, zinc, copper and some heavy metals.<sup>[6]</sup> However, these numbers vary, as combustion temperature is an important variable in determining wood ash composition.<sup>[5]</sup> All of these are, primarily, in the form of oxides.<sup>[5]</sup>

## Uses

### Fertilizers

Wood ash can be used as an organic fertilizer used to enrich agricultural soil nutrition. In this role, wood ash serves a source of potassium and calcium carbonate, the latter acting as a liming agent to neutralize acidic soils.<sup>[6]</sup>

Wood ash can also be used as an amendment for organic hydroponic solutions, generally replacing inorganic compounds containing calcium, potassium, magnesium and phosphorus.<sup>[7]</sup>

### Composts

Wood ash is commonly disposed of in landfills, but with rising disposal costs, ecologically friendly alternatives, such as serving as compost for agricultural and forestry applications, are becoming more popular.<sup>[8]</sup> Because wood ash has a high char content, it can be used as an odor control agent, especially in composting operations.<sup>[9]</sup>

### Pottery

Wood ash has a very long history of being used in ceramic glazes, particularly in the Chinese, Japanese and Korean traditions, though now used by many craft potters. It acts as a flux, reducing the melting point of the glaze.<sup>[10]</sup>

## Soaps

Potassium hydroxide can be made directly from wood ash<sup>[11]</sup> and in this form, is known as caustic potash or lye. Because of this property, wood ash has also traditionally been used to make wood-ash soap.

## Bio-leaching

The ectomycorrhizal fungi *Suillus granulatus* and *Paxillus involutus* can release elements from wood ash.<sup>[12]</sup>

## See also

- Ash burner
- Bottom ash
- Charcoal
- Fly ash
- Potash

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