

Charcoal Production

In the *tatara* ironmaking process, charcoal acts as both a fuel and a reducing agent. The burning of charcoal produces carbon monoxide, which reacts with and removes the oxygen from iron oxide (the largest component of iron sand) to create elemental iron.

Charcoal for *tatara* ironmaking was made from many different types of wood, including oak, pine, and chestnut. The wood was made into charcoal by heating it to hundreds of degrees Celsius in a low-oxygen environment that prevented it from catching fire. The charcoal used to fuel the furnace in the *takadono* workshop, like the larger pieces displayed below, and the charcoal used in *ōkajiba* forges (middle) and households (right) were made using different methods for different purposes. *Tatara* charcoal was heated longer at a lower temperature, leaving more volatile organic matter and a lower fixed carbon content, which caused it to burn faster and hotter.

Given the cost of transporting large quantities of timber for charcoal, ironworks were often located near forested mountains where wood could easily be gathered. The proprietor was responsible for managing the forest resources sustainably by harvesting wood in 30-year cycles. Operating a single *tatara* furnace for one year required around 110 hectares of forest, meaning that 3,300 hectares were chopped down and turned to charcoal over the course of a single cycle.