

Manganese

Manganese is a [chemical element](#) with the [symbol](#) **Mn** and [atomic number](#) 25. It is not found as a [free element](#) in nature; it is often found in [minerals](#) in combination with [iron](#). Manganese is a [transition metal](#) with a multifaceted array of industrial [alloy](#) uses, particularly in [stainless steels](#).

Historically, manganese is named for [pyrolusite](#) and other black minerals from the region of [Magnesia](#) in Greece, which also gave its name to [magnesium](#) and the [iron](#) ore [magnetite](#). By the mid-18th century, [Swedish-German chemist Carl Wilhelm Scheele](#) had used pyrolusite to produce [chlorine](#). Scheele and others were aware that pyrolusite (now known to be [manganese dioxide](#)) contained a new element, but they were unable to isolate it. [Johan Gottlieb Gahn](#) was the first to isolate an impure sample of manganese metal in 1774, which he did by [reducing](#) the dioxide with [carbon](#).

[Manganese phosphating](#) is used for rust and corrosion prevention on [steel](#). Ionized manganese is used industrially as [pigments](#) of various colors, which depend on the oxidation state of the ions. The [permanganates](#) of [alkali](#) and [alkaline earth metals](#) are powerful oxidizers. Manganese dioxide is used as the [cathode](#) (electron acceptor) material in [zinc-carbon](#) and [alkaline batteries](#).

In biology, manganese(II) ions function as [cofactors](#) for a large variety of [enzymes](#) with many functions.^[3] Manganese enzymes are particularly essential in detoxification of [superoxide](#) free radicals in organisms that must deal with elemental [oxygen](#). Manganese also functions in the oxygen-evolving complex of photosynthetic [plants](#). While the element is a required trace mineral for all known living organisms, it also acts as a [neurotoxin](#) in larger amounts. Especially through inhalation, it can cause [manganism](#), a condition in mammals leading to neurological damage that is sometimes irreversible.