

## Group 7 / VIIB; Manganese Group

Manganese has enormous technical importance; most steels need to contain some of the stuff. Your run-of-the-mill battery probably contains manganese compounds, and there are many other uses. Fortunately, it's plentiful and cheap.

- Rhenium is rare and not much used. Technetium does not occur naturally but must be made "technically" (hence the name) in a nuclear reactor.

### Basics

#### Table of Basic Data

Name <i>(German)</i>	Manganese <i>Mangan</i>	Technetium <i>Technetium</i>	Rhenium <i>Rhenium</i>
Atomic number	25	43	75
Atomic mass [u]	54,93805	98,9063	186,207
Melting point [K]	1517	2445	3453
Melting point [°C]	1244	2172	3180
Melting point [°F]	2.271	3942	5756
Boiling point [K]	2370	5303	5900
Density [g/cm <sup>3</sup> ]	7,44	11,49	21,03
Ionization energy [eV]	7,435	7,28	7,88
Electro-negativity	1,6	1,4	1,5
Atomic radius [pm]	124	135,8	137,0
Ionic radius [pm]	91	56	60
Oxidation numbers	7 bis -3	7 bis -3	7 bis -3
Lattice typ Transformation temp. [°C]	bcc 1138 fcc 1095 sc	hcp -	hcp -
Lattice constant [Å] (a or c)	8,89	2,74 4,39	2,76 4,46
Young's - Modul us [GPa]	208	407	461
Therm. expansion coefficient $\alpha$ [10 <sup>-6</sup> K <sup>-1</sup> ]	21	?	6,8

- In case of doubt all numbers are for room temperatures

- fcc = [face centered cubic](#); lattice const. = a
- bcc = [body centered cubic](#)
- sc = [simple cubic](#)
- hp = simple [hexagonal](#)
- hcp = [hexagonal close packed](#); lattice constants a and c.
- op = [simple orthorhombic](#), [monoclinic](#), [triclinic](#)
- tp = [simple tetragonal](#)
- dia = [diamond structure](#)
- r = [trigonal](#) or rhomboedral trigonal