

Greenwood & Earnshaw

2nd Edition

Chapter 24

Group 7

Manganese, Technetium &
Rhenium

Manganese, Technetium & Rhenium

•Manganese very common (0.106%), ocean-bed nodules, used in steel manufacture to remove Sulfur and Oxygen, used to color glass.

•Technetium has no stable isotopes, longest lived, 2.11×10^5 years, a beta emitter, isolated from spent nuclear fuel rods, few uses.

•Rhenium very rare (.0007 ppm), isolated from Mo flue dusts, UTK sole source from 1940-50. Used principally in catalysts.

•Mn(VII) is highly oxidizing, Tc & Re less so.

•Electronegativity trends are sharply reversed.

•MP lower for Mn vs Cr, Tc higher than Mo, Re 2nd only to W. Enthalpies of atomization lower for Mn/Re than Cr/W.

•Electrical resistivities are anomalously high for Mn and higher for Re than W.

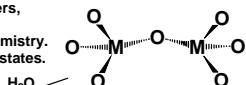
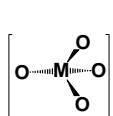
Oxides & Oxoanions of Mn, Tc, Re

Mn is very electropositive, pyrophoric powders, reacts with water to produce hydrogen. Mn(VII) to Mn(II) have extensive aqueous chemistry. Principally as oxoanions in higher oxidation states.

MnO_4^- Deep Violet

TcO_4^-
 ReO_4^- } Colorless

All have intense charge transfer bands, only Mn is in the visible, others UV.



M	mp °C	bp
Tc	119.5	310.6
Re	300.3	360.3
Mn		powerful oxidizer explosive

Oxides

MnO "rock salt" str. antiferromagnetic

MnO_2 Most important oxide.

Mn_2O_3 Does not have corundum str.

ReO_3 Octahedral, 1 e in conduction band very low resistivity $10 \mu\Omega$ cm.

TcO_2 } Most stable oxide Tc.
 ReO_2 } Have distorted rutile str.

Mn_3O_4 Spinel structure, mixed valence.

