

## 270 Mn MANGANESE

0.3- 15 ppm \ 180 Tests

*Colour Complex with Formaldoxime*

- Fill 16mmØ tube with a fully extended syringe (3.2mℓ) of sample
- Add 2 drops of **Mn-1** and mix
- Add 2 drops of **Mn-2** and mix
- Set aside for 2'
- Add 2 drops of **Mn-3** and mix
- Set aside for 5'
- Switch on the Photometer 660
- Enter  and press  for 270 Mn
- Set filter as indicated to 470nm and press
- Insert tube with plain water and press
- Insert tube with prepared sample and press
- Record as Manganese ppm (mg/ℓ)

At a level of 0.1%, manganese is the most abundant heavy metal in the earth's crust after iron (5%). The 1:50 ratio and chemical similarity to the latter prevents the formation specific manganese minerals in igneous rocks. Denudation and decomposition of iron-bearing silicates and oxides causes local enrichments of manganese with ratios nearer 1:10 on account of the latter's higher solubility. Dissolved bicarbonates and sulfates of divalent iron acidified by carbonic acid, under the reducing conditions of subsurface waters are immediately precipitated in contact with air to give rust-like ferric oxide. In contrast, the analog manganese compounds can stay in solution up to moderately alkaline pH-values. In this way they can reach the consumer, often undetected by colour or taste, via the distribution system in concentrations up to 10ppm. When this water becomes alkalized at the point of use above the limiting value by soaps or detergents, manganese will momentarily oxidize to give  $MnO_2 \cdot nH_2O$ , resulting in yellow to brown stains on laundry and dark deposits on sanitary fixtures. In extreme cases manganiferous water directly pumped from wells can discharge black sediment the moment it leaves the tap. Dissolved manganese was determined by *Denigès* in 1932 as the brown  $[Mn(CH_2NO)_6]^{2-}$ -complex with Formaldoxime (Mn-2). Masking agents (Mn-1) are added beforehand to improve the selectivity against iron. Subsequently *Goto, Komatsu & Furukawa* (1962) added a third reagent (Mn-3) to selectively eliminate the effects of residual iron.

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