# Characterisation of Workers Exposure in the Production of Manganese Alloys

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## ABSTRACT

During production of ferro- and silicomanganese alloys, workers are exposed to a variety of manganese oxides and metallic forms of manganese. In understanding the risk associated with exposure both the particle size distribution of the aerosol, the chemical and morphological states are recognized as important determinants. In light of the demand from international standard setting bodies, the need for realistic assessment of aerosol exposures has stimulated the development of sampling instruments to measure these related aerosol fractions (inhalable, extrathoracic, thoracic, tracheobronchial and respirable). Since very little is known about morphology and chemical composition of aerosol fractions in the manganese alloy industry, such information is also required.

A *chemical leaching scheme* has been developed for speciation of manganese compounds likely to be present; namely, a; water-soluble Mn (0.1M $NH_4Ac$), b; metallic (Mn, FeMn) and $Mn^{2+}$ - oxides (25% HAc), c; $Mn^{3+}$ - and $Mn^{4+}$- oxides (0.5% $NH_3OHCl$ in 25% HAc), and finally d; insoluble Mn-compounds (included SiMn) (aqua regia/HF). This method is based on sequential leaching of the aerosol fractions with reagents of increasing chemical "power" and can only differentiate among groups rather than individual manganese containing species.

Our aim is to illustrate how modern aerosol measurement and chemical characterisation can provide detailed information of workroom aerosols collected during production of ferro- and silicomanganese alloys. In an epidemiological study a group of 100 workers have been followed for 3 shifts using inhalable (IOM) and respirable (Cassella) samplers. The novel chemical leaching scheme was used for measurement of manganese in all collected aerosol samples. None of the work areas examined is characterisised by a single manganese contaminant. Very little manganese was present in respirable particles (10 % of inhalable). The extrathoracic aerosol fraction was largely responsible for the exposure experienced by the workers. Besides chemical leaching , a large number of individual particles (1474) have been analysed for the chemical composition by use of an electron microprobe. Although the majority of the individual particles had significant manganese content, absence of well-defined phases and simple stoichiometries was, however, surprising.

Further detailed results will be presented.