Mercury in the atmospheric environment

Summary

Reduction of mercury emission to the environment is a priority in actions made for protection of the environmental. The European Union documents states that in the first decade of the 21st century, from 3 to 15 million people in Europe are exposed to exceeded levels of mercury in the environment. The problems related to the atmospheric mercury emission from various anthropogenic sources are presented and discussed in the monograph, especially the aspect of mercury emission reduction.

Sources of mercury emission as well as the chemistry of mercury and its compounds, transformation in the off-gases and in the ambient air are discussed. A survey of methods of atmospheric mercury emission inventory and the emission factor values used for emission modeling was done. The data on atmospheric mercury emission in the past, at present and the prognosis for the future, globally and for individual continents, and particularly for Poland, have been presented. Primary and secondary emission reduction measures for mercury are described; recommended methods of mercury emission reduction have been indicated and characterized. The problem of the atmospheric mercury concentration has been confined in this monograph to the cases in which mercury concentration in the ambient air results from heat and power energy sources emission, i.e. the dominant atmospheric mercury emission source category in Europe.

Chapter one focuses on mercury in the environment as the global issue. The data on mercury production and consumption are presented and discussed. Alternatives of mercury removal from recycled Hg-bearing products are indicated as the most important activity undertaken to reduce the amount of primary mercury on the global market alongside with other priorities for abating the threat resulting from mercury presence in the environment, especially in the atmospheric environment.

Chapter two discusses the properties of mercury related to its emission and dispersion in the ambient air. The chemistry of atmospheric mercury and the deposition processes are also presented. The discussed data allow for a better understanding why mercury can migrate in the environment on very long distances and why this feature combined with mercury toxicity poses such a serious problem. Additionally, links between mercury chemistry in the emitted off-gases and its dispersion and transformation in ambient air are shown.

Chapter three deals with anthropogenic mercury emission sources in general. The metal's most dominant emission source categories in Europe and in Poland are discussed in details. The methods used for production of emission inventory data are described together with the mercury emission factors relevant for such emission calculations. A survey of data on mercury contents in raw materials which undergo thermal processing is included in the chapter. It refers to liquid and solid fuels, ores of ferrous and non-ferrous metals and minerals used for production of construction materials.

Chapter four deals with the global and European mercury load emitted to the air. Emission data concerning the situation in Poland are discussed in depth. Structure of the emissions i.e. the share of source categories responsible for the mercury emission in its total load is specified. The final section of the chapter refers to the prognosis of mercury emission to the ambient air in the perspective of 2020 in different scales: Poland, Europe and globally.

The final chapter addresses the mercury emission reduction issues with distinction of the primary and secondary methods. A critical review is made on the selected secondary methods including: dedusting

technologies relevant to particulate mercury emission reduction, adsorption methods used for reduction of gaseous mercury emission, desulphurization and denox technologies relevant for mercury emission abatement as well as the methods utilizing mercury chemical conversion. Particularities of the methods considering elemental and divalent mercury emission reduction requirements for mercury in the gaseous form as well as a component of particulate matter are described. The control methods and their combinations especially recommended for practical applications are also presented in this chapter.