6.3 CHEMICAL COMPOSITION OF PM PARTICLES INSIDE THE LABORATORY AND IN THE AMBIENT AIR NEAR THE COPPER SMELTER IN BOR, SERBIA

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Background and Aims: Numerous studies have reported that PM and its specific chemical constituents were linked to the incidence of respiratory diseases and mortality as well as lung function. Transition metals present in PM are able to damage DNA, induce mutations, and initiate carcinogenesis (Perrone et al, 2013). However, the quantity of every single metal in PM does not depend only on the magnitude of the source, but also on weather conditions; meteorological factors, such as wind direction and intensity, spread, dilute or even accumulate metals in breathable air (Garza-Galindo et al, 2019). The relationship between pollutant concentrations in the atmospheric environment and meteorological factors has been reported by numerous papers (Ledoux, et al, 2017). The main aim of this study is to determine metallic content in PM_{10} samples taken near the copper smelter. Outdoor PM_{10} samples were taken simultaneously at several locations in the close vicinity of the copper smelter, while the indoor PM_{10} samples were taken in the laboratory located inside the fenceline of the copper smelter complex in Bor, Serbia.

Methods: The measurement campaign was conducted during June and July in 2020. At all sampling sites, PM_{10} samples were collected with the low volume samplers (Sven/Leckel LVS3) on quartz fiber filters (Whatman QMA, 47mm) as the collection medium. The loaded filters, after gravimetric measurements, were further prepared for chemical analyses in accordance with the procedure of SRPS EN14902: 2013. The samples were analyzed by Inductively Coupled Plasma Mass Spectrometry (ICP MS). Urban particulate matter Certified Reference Material 1648a was analyzed for quality control and verification of the applied procedures for microwave digestion and trace element analysis. Recoveries were in the range from 80 to 120% for all measured chemical elements. In this way, the mass concentrations of 18 trace metals (As, Cd, Pb, Ni, Zn, Cu, Co, V, Mn among others) in PM_{10} samples were identified and quantified.

Key results: The results of the examination of the content of suspended particles of the PM_{10} fraction inside and outside the laboratory show that a significant part of the air pollution from the external environment reaches the laboratory except for As, Ni, and possibly Bi and In.

Conclusions: Of particular concern is that levels of most of the metals detected in PM_{10} samples are several times higher near point sources in the smelter than at a distance of a few hundred meters far from the copper smelter fenceline.

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