Abstract

The waste materials from the processing of metallic ores pose a significant environmental hazard, since their environmental exposure can lead to the release of the contaminants contained. Deposition of these wastes in dry warm climate can result in wind erosion and subsequent transport into the environment in a form of fine dust. Such dust contains high concentrations of dangerous substances and might therefore pose a potential risk for living organisms. Example of similar situation can be observed on mining sites in Namibia (Kombat, Oamites, Namib Lead & Zinc and Rosh Pinah) which are subject of this bachelor's thesis. Even though any activity in the majority these places has already ceased, excessive dustiness in areas surrounding tailings dumps still poses danger for local population. This thesis focuses on mine tailings from these areas, and its aim is to identify chemical and mineralogical composition of tailings samples, to define bioaccessibility of main contaminants (Cu, Pb, Zn) and to determine various exposure scenarios. Measurements conducted using pXRF, ICP-OES and ICP-MS revealed increased concentrations of main pollutants in samples – up to 14900 mg/kg Cu; 8880 mg/kg Pb and 24400 mg/kg Zn. Mineralogical analysis from SEM-EPMA showed that hazardous elements are part of sulfidic mineral phases (chalcopyrite, pyrite, pyrrhotite, sphalerite) as well as sulfates, carbonates and secondary ferric oxyhydroxides. Furthermore, test of gastric bioaccessibility confirmed main contaminants exhibit high bioaccessibility (up to 97 % of the total Cu; 94 % Pb and 98 % Zn). The element posing greatest risk in the studied areas is Pb, which exceeds tolerable daily intake (TDI) for children (weighing 10 kg) in most samples even during the most conservative exposure scenarios (dust ingestion rate of 100 mg per day). The most endangered people are those living in settlements and farms near tailing dumps (especially at Kombat and Rosh Pinah sites). Phytostabilization or wetting of the surface of tailings dumps could be used to decrease the amount of dust escaping in the air through wind erosion.