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Reach of pollution and sediment correlation with the tailings in Šibenik Bay (Croatia)

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To determine the influence of the historic factory of electrodes and ferroalloys on the Šibenik bay sediments, XRPD analysis were carried out. The factory was established in the city of Šibenik, on the coast of the Krka River estuary, and produced calcium carbide, and later electrodes and ferroalloys. It was active from 1900 until 1995 [1]. During that time, a large amount of produced tailings were stored nearby and on the shore of the estuary. Due to the presence of the strong winds (bora and sirocco), which can reach up to 130 km/h, the tailings material could be transported to long distances [2].

Samples of tailing were collected at the location of the former factory, which is a tailing hill today, samples of dust were collected from the rooftop of the factory in the 1980s. Other samples were taken on a 1 km distant beach in the Šibenik bay (Beach A) and a 19 km distant beach on the island in the outer Šibenik archipelago (Beach B). Both beaches are located south-west of the factory. The samples from the beaches were taken with a corer at different depths: 0 – 3 cm, 3 – 5 cm, around 5 cm. The sample from 3 – 5 cm depth was not analysed.

Bulk sample and a fraction <63 μm were analysed on X-Ray Diffractometer. The XRPD analysis of the sediments from Beach B in the outer Šibenik archipelago shows that calcite and quartz are the most abundant phases. This mineral composition shows that distant islands were not affected by aeolian transportation of the factory dust and tailing. In the bulk samples from Beach A, in the uppermost part (0 – 3 cm depth) mineral components are calcite, aragonite, calcium manganite, bustamite ferroan and carbon, while calcite, quartz, aragonite, calcium manganite and manganosite are present in the fraction <63 μm. The sample from the depth of 5 cm at the same beach, shows calcite, aragonite and Mn-oxide, while fraction <63 μm lacks in Mn-oxide.

A bulk sample of tailings shows mineral components: calcite, quartz, calcium manganite, bustamite ferroan and gypsum which corresponds to the previous research [3], and there is also manganese silicon, manganese silicide, carbon and amorphous phase [4]. A fraction <63 μm of the tailing, shows the following mineral phases: calcite, quartz, calcium manganite and bustamite ferroan, as presented in previous research [3]. Analysis of the rooftop dust shows three phases: carbon, bustamite ferroan and manganosite, which does not correspond to the data given from the factory [3].

From the presented results, it could be concluded that the historic factory influenced sediments in the Šibenik bay, however, its influence was not detected on the Beach B 19 km to the SW, which opens the question of reach and distance to which tailings can be transported by sea and/or wind.

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