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The extent of anthopogenic and geogenic contamination in an industrial alpine area in Leoben, Austria

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Speciation of nickel and chromium makes their increased level of concentration in any area critical for environmental measure and for human health because some species of them can cause skin allergy and cancer. The concentration of nickel and chromium in river sediment samples collected from an alpine river the Vordernberger Bach (Leoben, Austria) and soil samples collected from an allotment area situated near a local steel plant are determined and a correlation between the concentration of these metals and magnetic susceptibility values is found to a level of good extent. So, magnetic susceptibility meter with its characteristics (less time consuming, economical method, in-situ device etc.) is a very useful tool to generally assess and mark an area as contaminated by metals. The trend of concentration and speciation of these heavy metals (Ni and Cr) going downstream the river Vordernberger Bach (Leobener Hütte to Leoben City) away from its origin is studied. Local geology of the watershed was taken into account while identifying anthropogenic sources of contamination (e.g. steel plant) situated along the river. The goal is to understand the sources (point or diffuse, anthropogenic or geogenic) source of contamination of the soils, the river sediments and water for heavy metals. Study of soil samples from residential area of Judaskreuzsiedlung is investigated and the spherical particles (seen under EMPA) are found in greater number present in magnetic fraction than in non-magnetic fraction. These spherical particles are identified as magnetite (Fe3O4) with the help of Multi-Function Kappabridge for the measurement of Curie Point. The source of spherical particles can be traced to the steel plant. Moreover the presence of nickel, chromium, calcium, silicon, manganese and magnesium in magnetite particles is found. The nature (shape, size etc.) of metal carrier particles and the extent of concentration related with different size fractions, magnetic and non-magnetic fractions is being investigated by using analytical techniques, e.g. multi-function Kappa Bridge, ICP-MS, XRF, EMPA and laser ablation coupled to an ICP-MS. A clear increase in heavy metals from the pristine alpine source at 1500 m above sea level to the confluence of the Vordernberger Bach with the Mur River (540 m a.s.l) is observed which can be attributed to anthropogenic influence.