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About contaminant element composition of roadside dust samples from Budapest and Seoul, including Pt and Pd

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Roadside dust was sampled in Seoul megacity /Korea as well as in Budapest and some other places in Hungary, digested with reverse aqua regia in presence of bromine, and analyzed for 29 chemical elements with ICP-OES and ICP-MS methods. In addition to rather traditionally investigated elements, like Pb-Cd-Cr-Ni-As-Sb, newly emerging Pt and Pd from abrasion of automotive catalysts were included in the study. For the analysis of Pd, separation by precipitation with dithizone had to be applied. Principal component analysis was used as a tool to estimate the contribution of various sources. Geogenic element contents were used to estimate geogenic backgrounds und inputs from soils erosion.

Seoul is an East Asian densely populated megacity, not far from the seaside, and surrounded by granite rocks. To the contrary, Budapest is a European continental city surrounded mainly by plains formed in the tertiary. Background concentrations were estimated from median concentrations in soils over alluvial deposits from the East of Austria, as well as from Poland. Background concentrations for Seoul were estimated from Shiheung farmland soil, a town close to the megacity.

As a result, traffic related contaminations were highly effected by traffic related activities, like stop and go. Pt and Pb levels in roadside dusts from Budapest citiy were in the range of 2-133 μg/kg (av. 62,9 μg/kg), and 88 – 2838 mg/kg (av. 662 mg/kg) respectively. The highest Pt and Pb levels in roadside dust were found at major roads with high traffic volumes.

Due to the geo-accumulation index, in all roadside soils sampled in Hungary, Cu-Pb-Zn were enriched, and Cd-Mo and occasionally Ba from Budapest in addition, but As-Co-Cr-Hg-Ni-Tl-V were not. In roadside dusts from Seoul, heavy contaminations of As-Cd-Cu-Mo-Pb-Zn were found, but no significant increase of Co-Cr-Ni-V. The pollution index, which refers to the permissible levels of As-Cd-Cu-Hg-Pb-Sb-Tl-V, indicates heavy pollution for roadside dusts from both cities, and moderate pollution for roadside dusts from the rest of Hungary. Pt and Pd concentrations were strongly intercorrelated, but not with the pollution index.

In dusts from Budapest, Pt and Pd were strongly correlated with each other, and moderately just with Sn and Bi. In Seoul dusts, Pt was strong positively correlated with Ba-Cu-Fe-Ir-Mo-Pd-Sb, and slightly with Cr-Fe-Mo-Ni, but negatively with Ca-Cd-Hg-Pb. Pd in Seoul dusts, however, was positively correlated just with Pt and Ir, but negatively with K-Li-Na-Pb-Sr.