

Availability of platinum group elements and rare earth elements in urban road dust

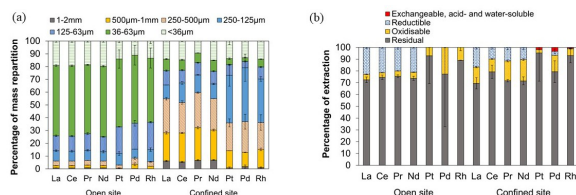
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Platinum Group Elements (PGEs) nanoparticles and Rare Earth Elements (REEs) oxides are conjointly used in catalytic converters to reduce the emission of pollutants (CO, NO_x, HC) in exhaust gases [1]. Mechanical abrasion of converters, as well as geochemical backgrounds, are sources of PGEs and REEs in urban environments. Road dust, which can contain PGEs and REEs [2], is a significant pollution exposure for the population. This work aims to assess the mobility and availability of PGEs and REEs in urban road dust collected in open and confined sites by (1) evaluating Pt, Pd, Rh, La, Ce, Pr and Nd concentrations in size-fractionated road dust and (2) estimating their chemical association after sequential extractions. Results showed that open sites had more than 60% of PGEs and REEs concentrations in fine-size fraction (<63 µm), which could be easily resuspended. In contrast, PGEs and REEs in confined site were mainly present in larger fractions (125 µm-1 mm) which could highlight different deposit conditions in terms of physical and chemical factors (e.g. absence of rain and light) inducing different modes of agglomeration. PGEs and REEs in both open and confined road dust deposit sites were mostly (>60%) associated with stable crystalline phases (e.g. quartz, albite). However, 21-31% of REEs were associated with weakly bound or organic fractions easily oxidisable. In addition, PGEs were identified in acid/water-soluble fraction (1-3%) with Pd more mobile than Pt and Rh. Overall, this work revealed the presence of PGEs and REEs in fine-size dust particles and up to 30% were present either in reducible or oxidisable fractions. This research contributes to the knowledge of PGEs and REEs availability in road dust and raises awareness of these emerging contaminants.

[1] J. Lucas, P. Lucas, T. Le Mercier, A. Rollat, & W. G. Davenport (2015), *Rare earths: science, technology, production and use*. Amsterdam Boston Heidelberg: Elsevier, 2015.

[2] J. D. Whiteley & F. Murray (2003), *Science of The Total Environment* 317,121–135.



Distribution of PGEs and REEs in (a) size-fractionated and (b) after sequential extractions of road dust