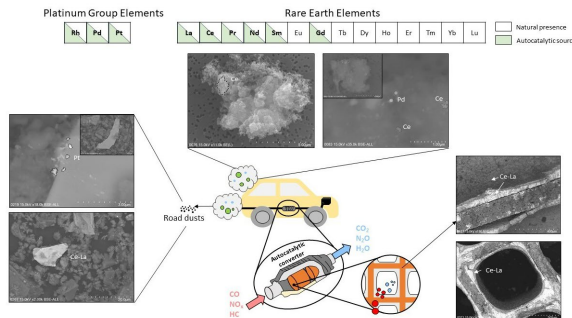


# The Platinum Group Elements and Rare Earth Elements' particles in road dusts

MARGOT BRUNEAU, LILIANE JEAN-SORO, MATHIEU GORIAUX AND BÉATRICE BÉCHET

Université Gustave Eiffel

Presenting Author: margot.bruneau@univ-eiffel.fr



Platinum Group Elements (PGE) and Rare Earth Elements (REE), with variable concentrations (0,001-70 mg.kg<sup>-1</sup>) in Earth's crust, are used in automotive industry because of their catalytic properties [1, 2]. Vehicles are composed of catalytic converters which help to reduce the emission of pollutants (CO, NO<sub>x</sub>, HC) in exhaust gases due to Pt, Pd and Rh nanoparticles and REE oxides [3]. However, mechanical abrasion of converters is a source of PGE and REE emissions into the urban environment. Roadside dusts contain many mineral particles which have anthropogenic and natural origins. The aim of this work is to evaluate PGE and REE contaminations as well as their physical and chemical characteristics in road dusts. For this purpose, road dusts were sampled at boulevard Victor Hugo in Nantes (open urban site) and the Nanterre-La Défense tunnel (confined urban site). The natural or anthropogenic origins of PGE and REE will be assessed in the light of reference values obtained for various soils and rocks sampled locally. Road dusts and natural background samples were analysed for concentrations with Triple Quadrupole high resolution ICP-MS (Agilent 8800) after an *aqua regia* (3 HCl:1 HNO<sub>3</sub>, v/v) microwave digestion. They were observed with Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X-Ray analysis (EDX) to determine morphology, size and chemical association of PGE and REE particles. Moreover, granulometry fractionation was carried out by sieving the road dusts. Results indicate strong to non-pollution with higher concentration of PGE in confined site and REE in open site, respectively. Pt and REE (Ce, La, Nd) microparticles, easily resuspended and inhaled, were observed isolated or associated with Si, Al, Fe or Zr. This finding is consistent with granulometry fractionation results which indicate higher PGE and REE mass distributions in small fractions ([36; 63 μm] and <36 μm).

[1] J.-F. Labbé & J.-J. Dupuy (2014), « Panorama 2012 du marché des platinoïdes ».

[2] BRGM (2022), « Ressources Minérales : Les terres rares ». Dossier enjeux des géosciences.

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