

# Solid state speciation of Pb and Cu in road-deposited sediments

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As urban populations increase so too does the importance and relevance of road-deposited sediments (RDS) to the urban environment. Identified as a major source of potentially toxic metals, contaminant bioavailability has to date been inferred rather than defined. However, the risk posed by RDS can only be effectively assessed and managed if the two key issues of the mobility of metal contaminants and the ease at which they can undergo transformations with changing environments are addressed. Fundamental to this is identifying the oxidation states, binding forms and partners of the metal contaminants.

Geochemical analysis has highlighted both the dominance of silica in the matrix of RDS and the considerable variance in contaminant concentration that exists between different grain-specific fractions (Cu 140ppm (1000-500  $\mu\text{m}$ ); 680ppm (<38 $\mu\text{m}$ ) and Pb 40ppm (1000-500  $\mu\text{m}$ ); 380ppm (<38 $\mu\text{m}$ )). Additionally, SEM and XRD analyses have shown that metal contaminants within the silica-rich matrix display a number of morphologies, occurring as discrete grains, grain coatings and very fine particulate matter. XANES and EXAFS techniques have been innovatively applied in this investigation to characterize the solid-phase speciation of copper and lead in RDS and to gain insight into the real-life situation on the road surface.

Pristine samples of four key grain-size fractions, 1000-500  $\mu\text{m}$ , 250-125  $\mu\text{m}$ , 63-38  $\mu\text{m}$  and <38 $\mu\text{m}$ , were examined for XAS using the Cu K-edge and Pb LIII-edge. Initial analysis of Pb and Cu XANES, using a library of minimum 8 model compounds for each of the metals, suggests that these metals exist in RDS in a number of different forms including carbonates, chlorides, nitrates, acetates and chromates, and in the case of Cu in the metallic form.