

# Comparison of three sequential extraction schemes for heavy metal fractionation in sediment samples

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## Abstract

Three existing sequential chemical extraction schemes (a 3-steps protocol proposed by the Standards, Measurements and Testing Programme (SM&T – formerly BCR) of the European Union [1]; Tessier 5-steps procedure [2] and 6-steps Grimalt's scheme [3]) have been compared. The methods have been applied to four sediment samples collected from two rivers namely Nakagawa and Tamagawa in around Tokyo, Japan. Between them, first one potentially exposed to contamination arising from anthropogenic activities. The comparison has been carried out by analyzing a certified reference material (JMn-1, produced by the Geological Survey of Japan) consisting of Mn-nodule occluded sediment for which no information regarding phase dependent concentration is available. In order to evaluate the partition of heavy metals among different geochemical forms, the concentration of chromium, copper, nickel, lead and zinc were measured in the liquid extracts by flame atomic absorption and inductively coupled plasma mass spectrometry. Other major elements and mineralogy of sediments were also determined by XRF and XRD, respectively which allowed qualitative correlation between the fractionation results obtained and the presence of defined geochemical phases. The total concentrations of heavy metals were determined after strong acid attack and the analytical precision was verified by its application to the reference material. Results of the comparison among three schemes showed no significant differences for total concentration of heavy metals of each element but some inconsistencies were found in the soluble/ exchangeable fractions and bound to carbonates form. On the other hand, in the case of all studied elements 6-steps procedure produced higher concentrations at metals associated to oxides and lower contents associated to the residual fraction.

## References

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