

Copper speciation in organic wastes by X-ray absorption spectroscopy

M. TELLA^{1*}, S. CHATAING¹, B. COLLIN², M.A. DIOT²,
M.N. BRAVIN³ AND E. DOELSCH¹

¹CIRAD, UPR Recyclage et risque, F-34398 Montpellier, France (*correspondence: marie.tella@cirad.fr)

²CEREGE, CNRS-UPCAM UMR6635, F-13545 Aix en Pce, France

³CIRAD, UPR Recyclage et risque, F-97408 Saint-Denis, La Réunion, France

The benefits of the use of organic wastes as fertilizers and soil amendments should be assessed together with potential environmental and toxicological impacts due to the presence of trace elements. The knowledge of trace elements speciation is essential to better understand their behavior after the spreading of organic wastes on soils and to predict their bioavailability. The present work aimed at studying speciation of copper (Cu) in various organic wastes (sewage sludge, composts and animal manure), which exhibit moderate to high levels of copper (24 to 340 mg kg⁻¹ dry matter). These wastes were selected because they are commonly used in several countries as fertilizer or soil amendment (Réunion-France, Madagascar, Senegal). Size fractionation was first performed to account for the complexity of wastes and X-ray absorption spectroscopy (XAS) has been combined with different analytical approaches to determine speciation.

Organic wastes exhibited a fairly large enrichment in Cu in smaller solid fractions (0.2-20 µm) in comparison with raw wastes (130 to 1 900 mg kg⁻¹ dry matter). X-ray Near-Edge Structure Spectroscopy (XANES) spectra were recorded on smaller solid fractions and analyzed by linear combination fitting (LCF) of references spectra. Analyses of pre-edge and inflexions in the absorption edge of spectra indicated that Cu is present in both Cu(I) and Cu(II) oxidation states. Therefore, LCF results showed that all small fractions are well fitted by different amounts of Cu(I)-S and Cu(II)-O in both octahedral and axial elongated octahedral (~square planar) geometries (Table 1).

	Cu(I)-S	Cu(II)-O	
		octahedral	square planar
Sewage sludge	60%	40%	≤10%
Composts	30%	40%	30%
FF-MSWC	≤10%	40%	60%

Table 1: LCF results for small size fractions of wastes (FF-MSWC=fine fraction from municipal solid waste composts)

In conclusion, Cu possesses its own chemical status and environments for each type of organic wastes, which could lead to different mobility after spreading on land.

Origin of Miocene volcanic rocks from Eskisehir, NW Anatolia, Turkey

S. TELSIZ^{1*}, A. TEMEL¹ AND A. GOURGAUD²

¹Hacettepe University, Geological Engineering Department, 06800 Beytepe, Ankara, Turkey

(*correspondence: stelsiz@hacettepe.edu.tr)

²Université Blaise Pascal, OPGC, Laboratoire CNRS

'Magmas et Volcans' 5 rue Kessler-63038, Clermont-Ferrand Cedex, France

Volcanic rocks from Eskisehir region containing pyroclastic products (deposits) and lavas/domes with basaltic and andesitic composition occurred in Early-Late Miocene age (19.5-7.9 Ma) based on Ar-Ar radiometric dating. Volcanic products in the region have both alkaline and calcalkaline characteristics; and their composition range from tephrite to rhyolite. It was determined that the samples of 19.5-16.8 Ma age and basaltic trachyandesite to rhyolitic composition with 0.703885-0.710988 and 0.512317-0.512489 ⁸⁷Sr/⁸⁶Sr-¹⁴³Nd/¹⁴⁴Nd isotopic ratios and low Nb/La<1 values were derived from a subduction zone and/or a lithospheric source enriched by crustal contamination process. On the other hand, it was concluded that the younger samples (13.6-7.9 Ma) with trachybasalt and tephritic composition with 0.703470-0.703505 and 0.512884-0.512930 isotopic ratios and high Nb/La>1 values were generated from an asthenospheric source with a low degree of partial melting, in the absence of crustal and lithospheric contribution.