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Mineralogy and partition of Cd, Ni, Cr, and Pb in soils from the ceramic cluster of Castellon (Spain).

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Heavy metals can be transferred from soils to other parts of the ecosystem, with effects at both the ecosystem level and on human health from transmission through the web chain. This environmental issue has concerned scientists [1]. Nowadays it is well known that ceramic clusters suffer from considerable air pollution due to the different pollutants into the atmosphere. Castellon province is home to the biggest nucleus of ceramic production in Spain, comprising 93% of the country's total production. This nucleus, located around the cities of Castellon, Vila-real, Alcora and Onda, has had an important process of industrial expansion [2]. In this context, heavy metal concentrations were studied in agricultural soils devoted to vegetable crops in the province of Castellon (NE Spain). Five topsoils (0–15 cm) were used in this experiment. The soils were selected for the proximity of the industrial emission focus and their physicochemical property diversities, especially pH and carbonate content. Soil 1 is a typical agriculture soil in the Alcora area. Almond trees are the prevailing cultivation, followed by olive trees, vineyards, some carob trees, but not many fig trees. Soils 2 to 4 are similar soils from an experimental plot in the La Plana area (Castellon, Spain). The cultivation in the experimental plot is comprised of orange trees. Soil 5 is from a disposal site in the Vila-real area. In addition, there are other terraced fields destined for the cultivation of carob, olive, hazel and almond trees. All studied soils are anthrosols according WRB.These soils are a type formed or heavily modified due to long-term human activity, such as from irrigation, addition of organic waste or wet-field cultivation used to create paddy fields. Contamination of soils by potentially toxic elements (e.g., Cd, Ni, Cr, Pb) from amendments of biosolids is subject to strict controls in relationship to total permissible metal concentrations, soil properties, and intended use within the European Community. This study is aimed at determining the chemical partitioning of Cd, Ni, Cr, and Pb in agricultural soils repeatedly amended with sludge. The distribution of chemical forms of Cd, Ni, Cr, and Pb in five biosolids-amended soils was studied using a sequential extraction procedure that fractionated the metal into soluble-exchangeable, specifically sorbed-carbonate bound, oxidizable, reducible, and residual forms. The biosolids incorporation has modified the soil composition, leading to the increment of heavy metals. The residual, reducible, and carbonate-sorbed forms were dominant. The mineralogical association of the clay fraction was illite, kaolinite, and chlorite.

Keywords
Ceramic Cluster: Biosolids-amended soils; heavy metals; sequential extraction; X-ray diffraction; inductively coupled plasma mass spectrometry; Spain.

References

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