SUITMA 11
11 th Conference on Soils of Urban, Industrial, Traffic and Mining Areas
Soils and the food, water, energy nexus
05.09.– 09.09 2022 Berlin, Germany

Does size matter? Method development for agronomic properties characterization of coarse fractions

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Abstract (max. 400 words)

Should the soil coarse fraction be considered a key element in the functioning of highly anthropized soils, especially regarding risk associated to contaminants? Soil quality diagnosis systematically dismiss it as inert for not contributing to the soil's nutritional potential or contaminants in the short term. However, in forest context, it can contribute significantly to the assimilation of essential nutrients by plants. Yet, insufficient research has been done to understand the influence of coarse fractions in terms of physicochemical fertility and their contribution to toxicity in the context of highly anthropized soils. In this context, coarse materials are found in various quantities and natures and can constitute in some cases the main source of pedogenetic evolution of these systems. This raises the questions of the evolution of the properties of the soil coarse fraction constituents as a function of their size, and the intensity of their contribution to the fertility and toxicity of highly anthropized soils. Hence, understanding of highly anthropized soils functioning appears incomplete.

Accessing the reactivity (*i.e.* fertile and toxic potential) of the fine fraction is easily done with well-established standardized analytical methods. However, these analyses are not directly applicable to objects whose dimensions are strictly greater than 2 mm such as constituents of the soil coarse fraction. Hence, these standard analyses must be adapted in order to have a better understanding of the role of coarse fraction in the functioning of highly anthropized soils.

In an original approach, a new methodology aiming at determining coarse elements reactivity is proposed and used on a set of five model materials representative of the diversity of constituents found in highly anthropized soils: limestone, brick, blast furnace slag, anthracite, petroleum coke. The results show that it is possible to characterize particles of diameter greater than 2 mm and qualify their reactivity. As expected a decreasing reactivity of the coarse fraction with increasing size particle was observed for most of the agronomic properties tested when expressed in mass concentration. However, per unit area, the coarse fraction expressed a similar or even higher reactivity than the fine fraction, thus supporting the method implemented.

The high reactivity of the fine fraction is therefore confirmed but the contribution of the coarse fraction to the provision of fertile and toxic elements cannot be neglected and should be considered to some extent. Coarse elements are no inert materials and contribute to the soil reactivity. This is admittedly not intense but should be considered for soil quality and risk assessment purposes.