



METHOD DEVELOPMENT FOR CD AND PB DETERMINATION IN LEACHING WATER OF MIXTURES OF SOIL AND ROCK BY GF AAS AIMING AT ENSURING ENVIRONMENTAL SAFETY AND FOOD SECURITY

Daiane Placido Torres^{a*}, Matheus Farias Grecco^b, Rosane Martinazzo^a, Carlos Augusto Posser Silveira^a, Adilson Luis Bamberg^a

^a Brazilian Agricultural Research Corporation, Embrapa Clima Temperado, BR 392, km 78, Pelotas, Rio Grande do Sul, Brazil, 96010-970. *daiane.torres@embrapa.br

^b Graduate Program of Management and Conservation of Soil and Water, Universidade Federal de Pelotas – UFPel, Jardim América, Capão do Leão, RS, 96010-900.

In 2013, the Brazilian Ministry of Agriculture, Livestock and Food Supply approved a law which includes remineralizers as an input category for agriculture¹. Remineralizer is a material of mineral origin (rock powder) which has undergone only reduction by mechanical processes and size classification and that changes the soil fertility indexes by adding macro and micro nutrients to the plants, as well as promoting the improvement of the physical or physical-chemical properties or the biological activity of the soil. Additionally, a normative instruction had to be created in order to establish rules for the usage of the remineralizers, fixing, among other parameters, maximum levels for As (15 ppm), Cd (10 ppm), Hg (0,1 ppm) and Pb (200 ppm)². Thus, on one hand, the remineralizers can contribute with macro and micro nutrients to the plant nutrition, on the other hand, trace elements may also be released from them to the environment as well as taken up by the plants, which may result in the food contamination. In that sense, a series of different soils and rock powders were mixed in the proportion 200:1 and placed in cylindrical columns in which deionized water ($EC < 2 \mu S cm^{-1}$) was passed by gravity to simulate a rain volume of 50 mm per event. The resulting leached water from this process was collected weekly, during fifteen weeks, acidified to $pH < 2,0$ and this was the matrix under investigation in the present work. By measuring Cd and Pb in the leached water over the weeks it was possible to assess the environmental safety of the usage of some rock powders in the different soils as well as the bioavailability of these trace elements to the plants. To comply with the reliable measurement of the analytes by GF AAS, some experimental parameters were evaluated, such as the linear range of the analytes, pyrolysis and atomization temperatures and usage of chemical modifier. An aliquot of 5 μL of a Pd-Mg solution, 5 $g L^{-1}$ of each, was added to the measurement solution in the graphite tube for each determination. The pyrolysis and atomization temperatures were optimized for both analytes, which were 400/1400 °C for Cd and 300/2100 °C for Pb. The calibration range for Cd was from 0.2 to 2.0 $\mu g L^{-1}$ and for Pb, 2.0 to 20.0 $\mu g L^{-1}$. The LOQs were 0.09 and 2 $\mu g L^{-1}$ for Cd and Pb, respectively. In order to validate the developed method for the determination of Cd and Pb, an addition and recovery test was performed with five out of the thirty samples of the experiment. The recovery ranges were 80.2-101.8% for Cd and 85.9-109.7% for Pb.

Acknowledgements: CNPq, Projeto Xisto Agrícola

References: 1 Brazil. Law N. 12.890, of December 10th, 2013.
2 Brazil. Normative instruction MAPA N. 5, of March 10th, 2016.