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### Livro de Resumos

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## Speciation of metals and metalloids in soils of deactivated mining areas by sequential extraction procedures

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### Abstract

Contamination of soil with toxic metals and metalloids is common at mining sites and surrounding areas. Those heavy metal and metalloids easily bind with soils and many are bioaccumulative or bio-magnified and as such is important to determine their total contents and their bioavailability. Measurements of the heavy metals and metalloids total contents in soils provide a general idea of the contamination but do not provide enough information on the potential toxicity of the soil. For that, sequential extraction procedures are applied to fractionate them into different groups classified by species.

In this work, the surrounding areas of three deactivated mining areas are under study: Sb-Au mines of the western limb of the Valongo Anticline, W mines of the Regoufe mining area and the Fojo coal waste pile near the Pejão coal mines. The metal(oid)s under consideration include Hg, As, Sb, Cr, Cd, Cu, Ni, Zn and Pb. Two digestion procedures to obtain total and pseudo-total contents of the heavy metals and metalloids in study are being applied, the first one using a HNO<sub>3</sub>-HClO<sub>4</sub>-HF mixture and ICP-MS analysis and the other following the ISO 12914 microwave aqua regia digestion procedure, analysed by atomic absorption spectroscopy (AAS). After determining the metals and metalloids of interest to analyse in each location the correspondent sequential extraction procedure is being applied. For Hg speciation the EPA 3200 procedure is being applied and the extracts analysed by cold vapor atomic absorption spectroscopy (CVAAS). As and Sb are being fractionated through the Shiowatana procedure and analysed by hydride generation atomic absorption spectroscopy (HGAAS). The remaining metals will be speciated using the BCR procedure and analysed by electro thermal atomic absorption spectroscopy (ETAAS).

Results obtained so far show that the samples of the burned area of the Pejão region are contaminated with Hg, As and Sb, according to the reference values of the Agência Portuguesa do Ambiente (APA) for agricultural soils (Hg - 0.16 mg/kg, As - 11 mg/kg, Sb - 1 mg/kg). Through the application of EPA 3200 procedure it was determined that although mercury is mainly found at the semi-mobile fraction (0.43-1.04 mg/kg) that is mainly composed of elemental mercury species and some amalgams, the content found at the mobile fraction (0.10-0.22 mg/kg), composed of organic and inorganic species of mercury, is close or even superior then APA's reference values. Information regarding As and Sb should also be available at the presentation date in Jornadas do ICT 2022.

**Palavras chave:** metais pesados; especiação; extração sequencial; contaminação de solos.