

Сојуз на хемичарите и технолозите
на Македонија



Society of Chemists and Technologists
of Macedonia

22nd Congress

with international participation

BOOK of ABSTRACTS

Sept. 05 – 09 2012
OHRID
Metropol Lake Resort



The 22nd Congress was organized by the
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SPATIAL DISTRIBUTION OF HEAVY METALS AND SOME LITHOGENIC ELEMENTS IN SOIL FROM COPPER CONTAMINATED AREA

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Monitoring with soil samples was conducted in area with intensive exploitation of copper minerals (copper mine "Bučim" near Radoviš, Republic of Macedonia). Soil samples from the surface layer (top soil) and from the deep layer (bottom soil) at the same locations were collected. Characterization of 18 elements contents was done: Al, As, Ba, Ca, Cr, Cu, Ga, Li, Fe, K, Mg, Mn, Na, Ni, Pb, Sr, V and Zn. Close mine environment was concern with higher Cu contents (max. value obtained of 1200 mg kg⁻¹), but the rest of the area was characterize with median value for copper content of 23 mg kg⁻¹. The enrichment factor of TS/BS for Cu was 2.8 for whole study area and ~10 times for very close mine environment. For the rest of the potentially anthropogenic elements (Cr, Ni, Pb, V, Zn) no significant enrichment factors were found for TS/BS relation. The lithogenic elements (Al, As, Ga, Fe, Li, Mg, Mn, Na, Sr) content showed stability in the vertical direction (TS/BS); but in a across direction, variability of element contents undergoes with the geology of the region. Characterization of element contents is in order of the type of land use. Maximum values for Cr, Ni and Pb were found in cultivable area (290 mg kg⁻¹, 190 mg kg⁻¹ and 130 mg kg⁻¹, respectively). Coefficients of correlation for the contents of the elements are represented in the matrix of correlation coefficients. With the factor analysis the distribution was reduced to three synthetic variables, which showed linkage in terms of geochemical similarities: F1 (Mg-Cr-Al-Fe-Ca-Mn-Ni), F2 (Pb-Ni-Li-Mn), F3 (Ba-Sr-K) and F4 (Zn-Ga-As-Fe) including 75% of the variability of analyzed elements. Spatial distribution of As, Cu, Pb, V and Zn showed that higher contents of these elements are deposited in mine vicinity; due to dust distribution from ore and flotation tailings. Distant areas were not concerned.

Keywords: Heavy metals, spatial distribution, copper mine, soil pollution, Republic of Macedonia

n.b.: Manuscripts submitted for this Congress were not subjected to language or other corrections, except in some extreme cases.
Authors are fully responsible for the content of their Abstracts.

CIP – Каталогизација во публикација

Национална и универзитетска библиотека „Св. Климент Охридски“, Скопје

54(062) (048.3)

66(062) (048.3)

CONGRESS of the Society of chemists and technologists of Macedonia (22; 2012; Ohrid)

Book of abstracts / XXII Congress of chemists and technologists of Macedonia (with international participation), September 05 – Септембер 09 2012, Lake Resort Metropol, Ohrid, R. of Macedonia; edited by Svetomir Hadzi Jordanov and Perica Paunovic; technical editor: Goran Nacevski – Скопје : Society of chemists and technologists of Macedonia, 2012. – 371 стр. : граф. прикази ; 24 см.

Регистар

ISBN 978-9989-760-11-2

а) Хемија – Собири – Апстракти б) Технологија – Собири – Апстракти

COBISS.MK-ID 91970826

2012
Macedonia