Whole-rock chemostratigraphy of diverse magma series in the Tertiary alkaline volcanics of Trabzon-Giresun area, NE Turkey

C. YÜCEL*, M. ARSLAN, İ. TEMIZEL AND E. ABDIOĞLU

Department of Geological Engineering, Karadeniz Technical University, 61080-Trabzon, Turkey
(*correspondence: cyucel@ktu.edu.tr)

The Tertiary volcanics of the Trabzon-Giresun area have a narrow extend lying along the Black Sea coast in NE Turkey as a part of Eastern Pontide Tertiary Volcanic Province (EPTVP) [1]. Petrochemically, the volcanics can be divided into mildly alkaline group with medium to high-K, and moderately alkaline group with sodic-potassic in characters. The mildly alkaline group contains two sub-suites as basalt, trachy-basalt and basaltic trachy-andesite (BTB) suite croping out as dikes and sills, lava flows-pillow lavas and breccias, and trachyte and trachy-andesite (TT) suite croping out as dikes and domes. The moderately alkaline group consists of basanite-tephrite (BT) suite croping out as brecciated lavas and breccias [2]. Major oxide and trace element versus SiO_2 variation plots suggest fractionation of common mineral phases such as cpx+olivine+Fe-Ti oxide in the BTB suite, plagioclase±sanidine+biotite+Fe-Ti oxide in the TT suite, and cpx+Fe-Ti oxide+apatite in the BT suite.

N-type MORB normalized trace element patterns exhibit subduction signatures with enrichment in LILE (Sr, K_2O, Rb, Ba), Th and Ce and depletion in Zr, Y, Nb, Ta and TiO_2 contents. The chondrite-normalized REE patterns show two diversing trends with moderately enriched (La_N/Lu_N=2.27-7.95) for mildly alkaline, and highly enriched patterns (La_N/Lu_N=29-49) for moderately alkaline volcanics The patterns have also concave shape with marked light REE enrichment and heavy REE depletion, implying effect of significant clinopyroxene fractional crystallization during the evolution of the mafic volcanic suites. Volcanic facies, chemostrigraphy and whole-rock petrochemistry of the Trabzon-Giresun area Tertiary alkaline volcanics reveal that there might have been diversing parental magmas derived from different degrees of partial melting of enriched lithospeheric mantle which was modified by paleo-subduction induced fluids and/or melts.

[1] Arslan, M. (2003) *Geology and Mining Potential of Eastern Black Sea Region Symposium Proceedings, Trabzon,* 103-105. [2] Yücel *et al*. (2010) *4th National Geochemistry Symp. Proceedings Book, Elazığ,* 31-32.

Metals and As in mine tailings drainage systems: Mobility and removal

N.V. YURKEVICH* AND O.P. SAEVA

Trofimuk Institute of Petroleum Geology and Geophysics SB RAS, Koptyug av., 3, Novosibirsk, Russia, 630090
(*correspondence: YurkevichNV@ipgg.nsc.ru)

Sulfide-bearing mill wastes are sources of high concentrations of acid, soluble metals and As. These are serious problems for ore mining areas such as the Kemerovo and Cheljabinsk regions in Russia. Contents of Cu, Zn, Cd, Pb, As, and Sb in wastes of the Belovo Zn-processing and the Karabash Cu-smelting plants are 2-3 orders of magnitude higher than the content of continental crust. Main mineral forms are pyrite FeS_2, chalcopyrite $CuFeS_2$, sphalerite ZnS, arsenopyrite FeAsS and scorodite $FeAsO_4*2H_2O$. High dissolved metals, As and Sb concentrations are found in drainage waters and influenced rivers; their concentration often exceeds Maximum Permissible Concentrations and background levels. Concentrations of metals, As and Sb in bottom sediments of the affected rivers are elevated a hundred meters below the input of drainage. These sediments become a source of secondary contamination.

Field experiments were conducted on the wastes – natural water interaction. Results of the experiments showed that 10-86 % of elements contained in the wastes pass into solution. Two groups of elements can be defined by their leaching behavior: relatively immobile – Sb, Pb, and Fe (10-16 %), and elements that are readily leached – As (67 %), Zn (70 %), Cd (71 %), and Cu (86 %). Leachates were used as influent to additional columns that tested limestone and a mixture of natural clay as geochemical barriers. The decrease in elements mobility in the clay and limestone columns is consistent with the accumulation detected in bottom sediments in the Belovo settling pond. In both the column and natural environment, Cd, As, and Sb is adsorbed on Fe (III) hydroxides at pH > 4 in oxidizing waters; changes of conditions to lower pH result in transfer of adsorbed elements into solution. An alternative to adsorption in oxic systems elements mobility is also decreased by the formation of sulfides and arsenides ($CuFe_2S_3$, Cu_3BiS_3, $NiAs_2$, $Ni_{11}As_8$, $Cu_9Sb_8S_{21}$, $CoAs_3$).

In addition, we propose electrochemical method for the treatment of high mineralized acid drainage (pH = 3.5, total concentration of Al, Cu, Zn, Cd, Pb, Fe, As, and Sb up to 10 g/L and sulfate-ion concentration up to 20 g/L) which is based on addition of metallic aluminium and allow to reach concentrations of elements in solution by 2-3 orders of magnitude lower then initial.