

The bullets weathering in microscale

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Shooting ranges represent places of extreme point source contamination. It endangers the natural environment and especially soil by release of risk elements (RE) e.g. Pb, Sb, Zn, Cu, Ni, Sb a Ag. This study monitors the loosening of selected RE from bullets and their fate in the soil.

Bullets' weathering represents RE input into soil; in monitored shooting range it was max. 7 g Pb kg⁻¹. The bullet with mantle, collected from shooting mound, was studied by Scanning electron microscopy (SEM) with EDAX detection. The bullet core is composed almost solely of Pb (Figure 1a). Other parts of the bullet have far more diverse composition and serve as another source of RE (Cu, Zn) in soil. Generally, the mantle is made of Fe with inner and outer Cu coating. The observed bullet is surrounded by corroded mantle and a mixture of iron oxides - detected by Raman spectroscopy. The remaining Cu layer can be seen inside of the mantle (Figure 1b) and in a mixture of corroded mantle and newly created Fe-oxides (Figure 1c). X-ray powder diffraction detected these newly formed Fe oxides and whewellit in the bullets surroundings and on the mantle surface. The Fe oxides and whewellit can serve as RE sorbent. A possible RE mobilisation was examined by BCR extraction.

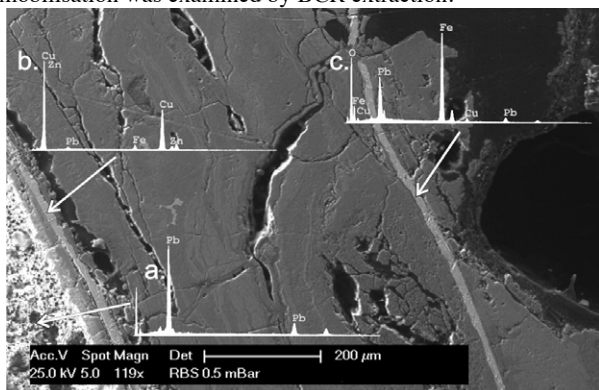


Figure 1: SEM image of bullet mantle with EDAX analysis.

The geochemical properties of manganese occurrences of Isparta, Turkey

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The manganese occurrences of Isparta are located in Bağıllı, Havutlu and İmrezi areas. Havutlu manganese occurrence and Bağıllı manganese occurrence are found in Tesbihli formation of Ladinian (Triassic), İmrezi manganese occurrence is found in Ispartacay formation of Triassic-Jurassic. Manganese mineralizations are seen generally cutting radiolarite in stockwork, lenticular and normal vein forms. Pyrolusite, psilomelane, braunite, todorokite, cryptomelane, rhodochrosite, manganese phosphide, jacobsonite, manganocalcite, pyrite, magnetite, hematite and goethite are determined as ore minerals in the manganese occurrences.

In the manganese occurrences, average composition is 20.19 % MnO, 2.98 % Fe₂O₃ and 70.63 % SiO₂. The diagrams prepared by using trace elements show that manganese mineralizations are determined in the hydrogenetic area and this also supported with the ratio of Fe/Mn of mineralizations.