

## **Case study of ancient iron slag founded in eastern and northwest of Albania**

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### Abstract

In Albania has been found many ancient iron artifacts and slags, which are evidence of an early metallurgy. Slag is the best material for studying this metallurgy, and can help in the search for the origin of artifacts of iron as well as production technique. The size, shape, microstructure of slag, resistance to corrosion, and chemical composition, enable connection of slag and minerals to detect specific treatments minerals and specific technologies (increased flows, etc.). Mineralogical composition study gives us more information on the conditions of slag formation. Archaeologists have found ancient slags coming from the production of iron dated from antiquity period, found in eastern (Qukes, KatundPlak) and northwest (Merqi and in Varosh) of Albania. Methods used to analyze those slags are, optical microscopy (reflected and polarized light) for micro structure investigations, X ray diffraction / X ray fluorescence to define the qualitative and quantitative phase and elemental compositions, as well as SEM-EDS. The densities of the slag samples are measured by double weighting method. The carbon content of steel grains founded inside the slags are measured using carbon & sulfur system, also Vickers microhardness were measured. Grains had different dimensions, they started from the smaller ones up to those of 1 cm and are steels of low carbon 0.1 to 0.35% C. Iron slags were mainly composed of wustite and fayalite set inside amorphous glass matrix, as well as of quartz and few magnetite. Comparing the distribution of slag phase compositions slag Mërqi 1 and Qukës 1, may be smelting slag.

Key words: Ancient iron slag, SEM-EDS, OM, XRD, XRF, Vickers microhardness, archaeometallurgy.