



## Chemical composition studies of flint with different origins

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Flint is a widely used material in the Stone Age because of its physical characteristics, which makes the material suitable for obtaining tools with sharp working edges. Chert, flint, chalcedony, agate and jasper in composition and several other physical characteristics are very similar. Therefore in archaeology most often they are determined simplified and are not distinguished, but described as flint or chert, denoting only the material in a general sense. However, in-depth studies it is necessary accurately identify the rock type and, in addition, to determine the origin of the flint and the conditions of the formation for the various archaeological research needs. As a typical example can be noted the localization problems in determining whether flint is local, or have emerged in the region through the exchange or by transportation.

Flint consists mainly from quartz and mostly it has cryptocrystalline or amorphous structure. In nature it occurs as nodules and interbedded inclusions in sedimentary deposits as a result of diagenesis processes when calcium carbonate is replaced with silica. Bedded chert primarily is accumulations originated from excess alkalinity in the sediments. Flint can also be formed in the crystallization processes of the chemically unstable amorphous silica. In this context, it should be noted that flint is naturally heterogeneous and very varied material by the physical properties and therefore problematic in many contemporary studies.

In the study different origin flint samples from England, Denmark and Latvia were compared after their chemical composition. Flint nodules from Northern Europe chalk cliffs formed as inclusions in interbedded deposits or results of the diagenesis and samples of chalcedony saturated dolomite from Latvia formed in hydrothermal processes were analysed using XRD and XRF methods. The obtained data were statistically analysed, identifying major, minor and trace elements and subsequently assessing the chemical composition characteristics of the various origins flint.

The obtained data indicates that in the flint nodules the amount of silica is large and relatively stable, as well the presence of other chemical elements are uniform and relatively homogeneous. In turn, in the chalcedony saturated dolomite can be observed the highly variable quantity of silica, the unstable proportion of Ca-Mg and other key chemical elements and the constantly present rare earth elements, whose concentration can be significant.

The performed analysis confirmed that with the chemical composition analysis it is possible to distinguish flint formed in the different geological conditions, as well as to evaluate the indicative characteristics.