

Summary

In this thesis Raman microspectrometry is evaluated to answer following question: is it possible to differentiate graphite, carbon black, different disordered carbonaceous mixtures or soot in the frame of pottery of different origin?

The “black pottery” set investigated here includes: black pottery fragments from historical periods (Bronze and Iron Ages) as found in Central and Southern Bohemia, pottery pieces with lustrous possibly “graphitic” layer, fragments of folk art pottery from 20th century, fumigated pottery pieces as well as a replica of fumigated pottery. Knoviz and Hostivice Hallstatt culture samples are compared with common pottery from The Middle Ages and current imitations.

The characteristics of two major carbonaceous Raman bands from the first order spectrum are investigated here (“disorder”, D~1370 cm⁻¹, graphitic, “order” G~ 1600 cm⁻¹).

Band positions were used, as well as calculated spectroscopic parameters such as D and G peaks width ratios and the D/G area ratio. These parameters characterize well various types of carbonaceous matter. According to the area ratio D/G of the carbonaceous matter individual investigated pieces fall in three groups

(i) Graphitic carbon, parameters: half-width G 20-21, ratio of half width WD/WG: 1,82 – 3,42, ratio of the area AD/AG: 0,13-0,3, ratio of the intensities ID/IG 0,08-0,18. Graphitic cores, were present in the original raw materials used for the production of the ceramic artifacts.

(ii) Transitional type of carbonaceous matter parameters: half-width G 71-93, ratio of half width WD/WG: 1,34 – 2,14, ratio of the area AD/AG: 0,45-1,1, ratio of the intensities ID/IG 0,29-0,64. The origin is related to condensation of the smoke containing non-graphitic substance on the surface of the artifacts during the firing and the cooling of the ceramic.

(iii) amorphous type parameters half-width G 78-101, ratio of half width WD/WG: 1,1 – 1,64, ratio of the area AD/AG: 1,11-1,37, ratio of the intensities ID/IG 0,68-0,9. This is the least organized CM phase. The process of the origin of the carbon was probably was analogical to the process described in the group (ii)

This study demonstrates the usefulness of the application of Raman microspectrometry to illustrate the structural state of the carbonaceous matter contained in/on “black pottery” of different origin. Graphitic carbon, transition high-disorder carbonaceous matter and turbostratic low-ordered carbonaceous matter are the most characteristic compounds detected in the investigated pieces of the pottery.