Contribution ID: **16** Type: **Poster**

P44 - Some applications of micro-PIXE in the study of ancient bronze, silver and obsidian artifacts

Friday, 11 July 2014 13:00 (1 hour)

A study concerning the copper provenance of some Bronze Age items (axes, sickles, daggers, swords, celts) found on Romanian territory was performed at AN 2000 accelerator in Legnaro . The problem consists in their classification from the Bronze Age regional mines point of view –North-East Bulgaria [Ai Bunar –"fingerprints"minor-trace elements As (up to 2-3%), Ni and Sb (hundreds of ppm)], Serbia [Rudna Glava and Majdanpek –"fingerprints"trace elements As, Sb, Ni, Ag, Se (thousands-hundreds ppm)] or Transylvania (e.g. Baia-Mare –"fingerprints"trace elements Sb and Ag –thousands of ppm). We analyzed 15 very small samples (less than 500 microns diameter) from different archaeological sites in south Romania –especially axes and sickles. The majority presents relevant traces of arsenic and antimony, suggesting the use of copper from north Bulgaria.

For silver items, we performed a study on some Silver (drachms) issued between V and III Century BC by Greek colony Histria –situated on Romanian Black Sea coast and on Dacian silver imitations of Greek silver tetradrachms to detect trace elements which can be used as fingerprints for Silver provenance (e.g. bismuth for South-Balkans deposits, antimony for Carpathian deposits, gold, lead) and to determine copper content which is an indicator of the metallurgical procedure - copper was used to increase the mechanical properties of silver.

We also used micro-PIXE to study some Neolithic micro-tools (blades) found in Romania to determine the obsidian provenance: Tokay Mts. (Hungary, Slovakia), Melos (Greek islands), Lipari, etc. Micro-blades found in Magura - an important Early Neolithic site from Teleorman county, Muntenia, approx. 100 km South-Vest of Bucharest –were analyzed. To identify the obsidian sources we used the group Rb-Sr-Y-Zr, a "pattern" specific for each source as illustrated in PIXE spectra. Our results suggest for Magura Early Neolithic –Crish Starcevo culture (6200 –5200 BC) samples some Aegean sources, obsidian arriving from Macedonia crossing the Balkans.

Our studies demonstrated that micro-PIXE is a good analytical tool to investigate the composition of ancient artefacts in order to determine their provenance, especially the geological sources of metals and obsidian.

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Session Classification: Poster Session with Cheese and Wine