Using Nuclear Techniques for the Characterization and Preservation of Cultural Heritage Artifacts in Bulgaria

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Applications of Nuclear Techniques for Characterization of Cultural Heritage Artifacts

- X-ray fluorescence analysis
- Electronic probe microanalysis
- Scanning electron microscope
- ICP-MS; LA-ICP-MS

National Academy of Arts

• Identification of pigments
• Determination of the state of preservation the artifacts.
Gold Thracian appliqués – authentic or fake?

25 golden finds were analyzed using **ED-XRF** (Shimatzu EDX-720) at the Laboratory of conservation and restoration of the National Archaeological Institute with Museum to Bulgarian Academy of Sciences.

Chemical Composition of Gold Breast Plates from Ancient Thrace (5th – 4th Century BC)

By **ED-XRF** the content of Au, Ag and Cu in 7 gold breast plates dated to 5th-4th century BC and preserved in National Archaeological Institute with Museum to Bulgarian Academy of Sciences was determined.

Certified reference materials of metal alloys

Set of 4 Au-Ag-Cu-reference materials were prepared in the Faculty of Chemistry, University of Sofia in the frame of the IAEA TC project RER/8/015.

Certified values (%) obtained using ED-XRF instruments

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<thead>
<tr>
<th></th>
<th>IAEA-1</th>
<th>IAEA-2</th>
<th>IAEA-3</th>
<th>IAEA-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Au</td>
<td>96.68±0.11</td>
<td>93.01±0.20</td>
<td>87.81±0.07</td>
<td>73.70±0.08</td>
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<tr>
<td>Ag</td>
<td>2.68±0.02</td>
<td>5.60±0.02</td>
<td>10.83±0.04</td>
<td>23.87±0.07</td>
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<tr>
<td>Cu</td>
<td>0.26±0.01</td>
<td>0.56±0.02</td>
<td>1.08±0.03</td>
<td>2.33±0.05</td>
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</tbody>
</table>

Analysis by PIXE to be performed

The reference materials are prepared for calibration of non-destructive methods of analysis of Au-Ag-Cu alloys (XRF, PIXE).

The reference material (alloy embedded in resin) must be put on the way of the excited radiation.

The spot of the excited radiation do not be larger than 40 mm².
NATIONAL WORKSHOP FOR CONSERVATORS AND RESTORERS

in the frame of the project of the IAEA „Using Nuclear Techniques for the Characterization and Preservation of Cultural Heritage Artefacts in the European Region”

Sofia University “St. Kliment Ohridski”
International Atomic Energy Agency
Ministry of Culture of Bulgaria
Bulgarian Nuclear Regulatory Agency

Number of participants: 35
Number of given lectures: 12
Gamma irradiation facilities

19 gamma irradiation facilities
(195 sources Co-60 and 126 sources Cs-137):

• 10 in the medicine

• 9 in the industry and research

  ■ BULGAMMA (Sopharma AD)
    □ Co-60 – 59040 Ci
      ■ sterilization (medical products and materials)
      ■ increasing of storage periods
      ■ disinfection (cosmetical and pharmaceutical products)
      ■ modification polymers’ structures etc.

So far no radiation processing for cultural heritage preservation is performed.
THANK YOU FOR YOUR ATTENTION!