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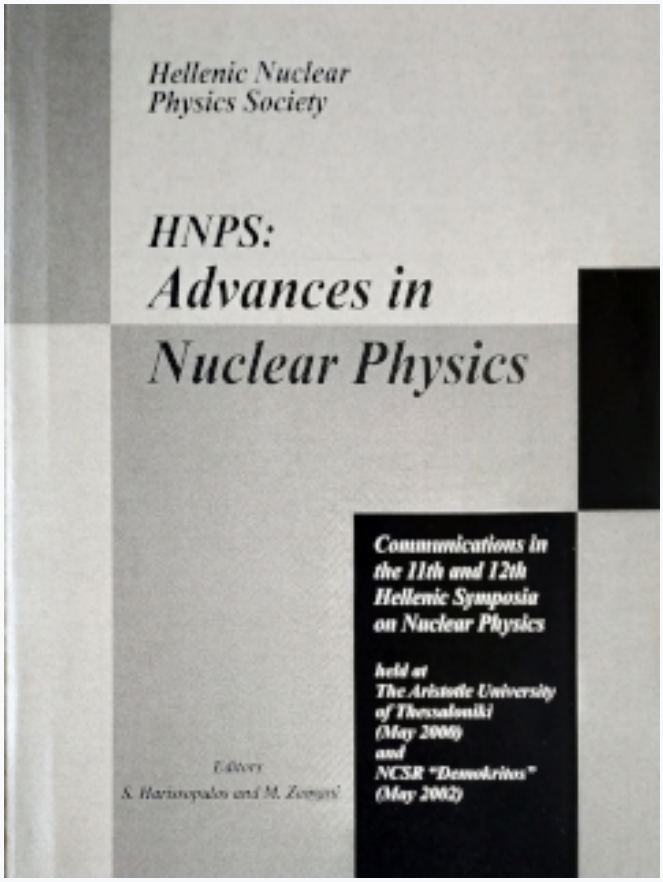

Copper and sulphur depth profile in patina layers using NRA and RBS

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Copper and sulphur depth profile in patina layers using NRA and RBS

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Abstract

A combination of nuclear reaction analysis (NRA) and Rutherford backscattering spectroscopy (RBS) were utilized in order to obtain information on the depth distribution of sulphur and copper in artificially produced and natural patina layers. The copper profiling was performed by using the reaction $^{63}Cu(p,p'\gamma)^{63}Cu$ and detecting the 1327 keV γ-ray deexciting the third excited state to the ground state of ^{63}Cu produced. For the determination of sulfur the 2230 keV γ-ray was used, deexciting the first excited state to the ground state of ^{32}S formed through the reaction $^{32}S(p,p'\gamma)^{32}S$, which exhibits three sharp resonances at projectile energies 3.094, 3.195 and 3.379 MeV. The relevant cross-sections were measured in the energy range between 3.0 and 3.7 MeV in steps of 20 keV at 125° to the incident proton beam direction. Supporting information on the depth distribution of oxygen and the other elements of the patina samples was obtained by p-RBS (E_p = 1.5 MeV; θ = 160°).