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Laser-Induced Breakdown Spectroscopy analysis of the limestone Nuragic statues from Mont'e Prama site (Sardinia, Italy)

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ABSTRACT

In this study, we report the results of a micro-destructive analysis of stone materials used for the realization of the Mont'e Prama statues, important limestone sculptures dated to the Early Iron Age (Late Nuragic period: 9th-8th cent. BC) from central-western Sardinia. Although numerous historical, archaeological and geological studies have been already performed on these artefacts, up to date, information and data about reliable location of raw materials supply and chemical-physical weathering processes occurring in the millennia are missing. In order to fill this gap and provide fundamental information for the proper conservation and preservation of these artefacts, twenty-two micro-samples from limestone Nuragic statues were analysed. Laser-Induced Breakdown Spectroscopy (LIBS), with the support of petrographic and mineralogical (optical microscopy and X-ray diffraction) analyses, was applied for defining the chemical composition of the rocks, as well for studying the surface features of the sculptures. This latter approach was useful to define alteration processes occurring on the surface and to identify the possible ancient treatments used for colouring or preserving the statues. LIBS results on the Mont'e Prama statue materials were processed by blind clustering analysis, including reference data of fifteen limestones sampled from the nearest supply areas. Hypotheses on provenance of raw materials and on surface treatments/secondary phases are finally discussed and proposed, highlighting the merits of the LIBS method in archaeometric provenance studies.

Keywords: LIBS, Non-destructive analysis, Applied mineralogy and petrography, XRD, Nuragic sculptures.

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