Laser Induced Breakdown Spectroscopic Analysis of Preserving Patina on Marble and Travertine Surfaces

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The determination of the mineralogical properties and their corruption problems of the stones in archeological areas is an important area of research in preservation studies [1]. Laser Induced Breakdown Spectroscopy (LIBS), as a micro-destructive analysis technique, is one of the analytical tools used in the cultural heritage studies. This technique allows multielement, in situ analysis with in-depth chemical information [2].

In this study, mineralogical, chemical and micro-constructional properties of the crusts and intact inner parts on the surface of marble and travertine samples taken from Aizanoi and Hierapolis (Figure 1 and 2) ancient cities were investigated using SEM-EDX and LIBS. Formation of plaster stone, clays, biological formations and calcium oxalate layer were observed on the surfaces of withered marble and travertine. The cause of formation of plaster stone is the contaminated air. The clays are carried with wind and rain. In the presence of clays and water, biological formations were formed on the surface of stones. On the other hand calcium oxalate layer occurs as a result of reaction of calcium carbonate with oxalic acid which is produced by biological formations. This layer acts as a protective crust on stone surfaces. So it is significant to protect this layer during the cleaning of plaster, clays and biological formations from the surface of stones. Experimental LIBS results on the chemical composition and thickness of oxalate layers on the surface of marble and travertine samples will be discussed.

Figure 1. Aizanoi Zeus Temple

Figure 2. Hierapolis Nekropolis

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REFERENCES: