



Characterisation and Historical Quarries Location of Marbles from Guarrazar Archaeological Site (Toledo, Spain).

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Marbles have been used for the beautification of cities, temples and palaces throughout history. These building stones are compositionally analogue but show differences in texture and colour that can be associated with some petrographic and petrophysical properties, which makes possible to identify their origin.

A variety of building marbles from Guarrazar archaeological site (Toledo, Spain) was investigated. This site was a monastic-palatial complex linked to the Spanish Visigoth kings. It is archaeologically significant because Guarrazar's treasure, composed of gold votive crowns and crosses of the 7th century, were found in this site and are preserved in the National Archaeological Museum of Spain, in the Armory of the Royal Palace of Madrid and in the Cluny Museum of Paris, France.

The marbles were characterised petrographically, with polarisation optical microscopy; mineralogically with XRD; petrophysically with ultrasound pulse velocity, Hg intrusion porosity and colour measurements and chemically with isotopic analysis, which is carried out by mass spectrometry. All these analyses were carried out to locate the historical quarries of the marbles used in the basilica of the Guarrazar archaeological site.

Most of the analysed samples were reused marbles from Roman structures. The calcitic marbles are white and pinkish, and some of them have an irregular distribution of small greyish veins. They are medium grained, showing grain sizes from 103 μm up to 1.75 mm, and an average value of 423 μm . Mercury intrusion porosity ranges between 0.77 and 0.42 %. The main type of marbles comes from Estremoz Anticline, Ossa-Morena Zone (Southern Branch of the European Variscides in Portugal), distant approximately 300 km from the site. This 40 km NW-SE structure has been mined intensively since the Roman Period.

Estremoz marble is designated as Global Heritage Stone Resource (GHSR) by Heritage Stones Subcommittee of the International Union of Geological Sciences (IUGS). This designation seeks international recognition of those natural stone resources that have achieved widespread

utilization in human culture.