Abstract

Palaeozoic calcareous marbles are found in the Estremoz Anticline, Ossa-Morena Zone (Southern Branch of the European Variscides in Portugal). The 40 km NW-SE structure presents nidosus contacts and intense mining activity since the Roman period (fourth century BC). The marbles occupy an interbedded stratigraphic position in the Cambrian age Volcano Sedimentary Sequence. The Variscan Orogeny performed with different intensities under ductile and brittle tectonic fields. The Alpine Cycle also acts and causes more fracturing of the marbles. These show spatial-temporal continuity of the deformation where a complete Wilson Cycle can be described. The geological features imprint the marbles beautiful aesthetic patterns that are highlighted when used on dimensional stone.

Nowadays most of the quarries are placed in the counties of Borba and Vila Viçosa. This last city claims for itself the "Capital of the Marble" title and named the marble as "White Gold". The marbles exhibit physical properties (Table 1) allowing fabrication of structural and decorative elements. In the Roman period, pieces of art made with Estremoz Marbles were exported abroad and can be found in Museums and Archaeological Sites throughout Europe and North Africa countries. During the maritime expansion, altars, stairways, columns, statues, etc., were carried as ballast in the holds of ships. All the destination the Portuguese had built monuments which can now be found all over the World. Notice that every variety of marble has enough reserves to sustain the mining activity for several hundreds of years.

The Modern Dimension Stone Industry Global Market allows Portuguese Marbles to be present all over the World. In few words it cannot be covered all the examples and applications where the marble has been used. Therefore, must be noted that the intrinsic physical properties, versatility of colors and patterns and know-how of the companies, allow each end user to be held by a single piece of exceptional quality.

Marble Variety

The «Estremoz Marble» exhibit colors ranging from dark blue to pure white (Fig. 5). The green ones are rare and indigo is infrequent. Any variety can show stripes or multicolored gradients. The clear pink, amíle and ivory are the most valuable and appreciated varieties. Figures 6 and 7 represent the same mosaic and so show evident marble transcutancy.

In the hands of skilled sculptors, the stone comes to life in impressive fashion as is the case of César Vazuro (Fig. 8).

Table 1 - Physical properties and carbonated composition of Portuguese and foreign marbles. (Data: http://www.estremozmarble.com; http://www.velaonline.de)

Geology and Stratigraphy

Recent studies based on U-Pb geochronology of detrital/inherited and igneous zircons from sedimentary and igneous rocks of the Ossa-Morena Zone have reinforced that SW Iberia reflects the geodynamic evolution of the North-Gondwana margin during the late Ediacaran to early Cambrian times (Chistrom et al., 2008; Limmermann et al., 2008; Pereira et al., 2008, 2012; Sánchez-García et al., 2008; Solé et al., 2008).

The following date present new U-Pb dating of zircons of the stratigraphic sequences of the Estremoz Anticline that is a major Variscan structure of the Ossa-Morena Zone (Portugal). Figures 1 to 3 in Pereira et al., 2012, Fig. 4 - Google Earth image (© 2007), with the location of the main towns in the region and Geology of Marbles, J. & Vieira, C. (1997).

1. Almost every major cogenetic stratigraphic zone (adapted from Julve, 1987); Map showing the location of the age of the Paleoproterozoic and Cambrian rocks in the Ossa-Morena Zone (adapted from Pereira et al., 2006); Simplified geological map (adapted from Gonçalves, 1972) and cross section of the Estremoz Anticline (Sample locations used for R-Rheonometry).

2. Stratigraphic of the Ossa-Morena Zone of the Estremoz Anticline (adapted from Gonçalves, 1972 and Sánchez-García et al., 2010).

3. U-Pb zircon geochronology of some representative rocks from Ossa-Morena Zone (adapted from Julve, 1987; Sánchez-García et al., 2010).

4. Detailed geology of this Estremoz Anticline. The Variscan-Sedimentary Complex is represented in blue. Dark blue represents the grey and dark blue marbles (commercially named as "Maricope") and light blue represents all other varieties of choletmarbles.

Built Stone Heritage

The marble has been primarily used as a decorative element (dimension stone). Fig. 8 - Particular house in Borba), however there are many examples of structural element utilisation. The examples showed Castle Tower (Fig. 10) and the Church of Santa Maria in Estremoz (Figs. 11). The Vila Viçosa Palace is another example of a magnificent coated marble monument, though seems to have marble walls (Fig. 12).

Concluding Remarks

In few words it is impossible to cover all the examples and applications where the marble has been used. Therefore, must be noted that the intrinsic physical properties, versatility of colors and patterns and know-how of the companies, allow each end user to be held by a single piece of exceptional quality.