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Ceramic body of tiles characterization by means of Ion beam analytical techniques

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Tiles are composed of a ceramic body covered by a vitreous glaze layer, usually coloured. The ceramic body acts as support of the glaze and its quality is essential for the good conservation and preservation of tiles along the centuries. Some of the factors which will affect the ceramic body quality are the kiln temperature during the manufacturing process and the raw materials used. For example, underfired bodies will tend to be soft or when they are overfired ceramics will be brittle. The initial materials, as clays, will also affect the final composition of the ceramic body, with influence for instance in its hardness or final colour.

The first uses of tiles appeared in the region of Mesopotamia, Egypt and Persia, being the beginning of an enduring tradition. From there, the tile manufacturing technology and utilization spread worldwide, usually through commercial circuits, and consequently the tile evolved and adapted to each culture and local styles. In Portugal, tiles are everywhere, they can be found for example for wall decoration in official buildings, churches or monasteries, or in fountains. They often represent scenes from the history of the country, or geometrical design.

In this work we propose the combination of non-destructive Ion Beam Analytical (IBA) techniques to assess the manufacturing conditions of ancient tiles, especially the ceramic body. The conditions to be determined are:

- the identification of the raw materials through the study of the elemental composition by means of PIXE and PIGE techniques;
- the firing temperature through the study of the compounds or particular mineral phases present in the ceramic body by means of Ionoluminescence measurements.

In this work a set of tiles with quite different chronological production (from the XVII to the XX centuries) were analysed and the obtained results will be presented and discussed. Composition results will be compared with other more established techniques, as for example XRD.