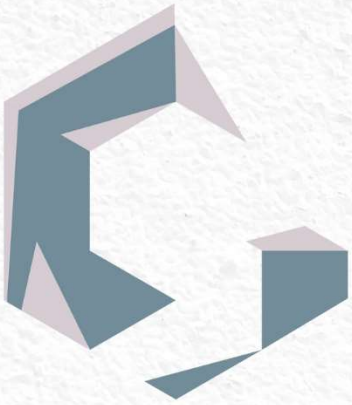

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7th EDITION

MOSTEIRO DA BATALHA

BATALHA, PORTUGAL

PROCEEDINGS

18TH - 23RD OF JUNE 2023

ASSIMAGRA
MINERAL RESOURCES OF PORTUGAL

CLUSTER PORTUGAL MINERAL RESOURCES

UNIVERSIDADE DE ÉVORA

GLOBAL STONE CONGRESS 2023 | BATALHA, JUNE 18 – 23

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NEW CHALLENGES ON DIMENSION STONES, FROM PORTUGAL TO THE WORLD

Responsibility for the information and views set out in this publication lies entirely with the authors

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Main deterioration patterns found in Lioz Limestone at Rio de Janeiro, Brazil

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Lioz was widely used in Portugal's and Brazil's historical buildings and in other countries that Portugal colonised during its maritime expansion. This limestone presents different colours and receives different names depending on its aspect and the extraction area. The most common are Lioz (the beige one), Amarelo Negrais (the yellow one exploited at Negrais), Encarnadão (the red one) and *Chainnette* (the cross-cut beige variety that looks like a chaine). In Rio de Janeiro this stone can be seen in facades, ornaments, walls, floors and other uses in churches, buildings and monuments from the 16th century onwards. Some examples are the Rio de Janeiro's landmark built in Lioz and brought to Brazil in 1565, the Estácio de Sá Tombstone (1583) and the Santo Antônio Convent and Church (1620). Lioz received the IUGS - Heritage Stone designation in 2018 a recognition granted by the International Union of Geological Sciences (IUGS) to natural stones used in heritage monuments and edifications significant for human culture.

The city of Rio de Janeiro has a polluted and saline environment, which combined with the tropical weather and frequent vandalism, can accelerate the degradation of this stone. Despite the compactness of Lioz and its outstanding characteristics as a building material, its fossils and stylolites can be weakening zones. The presence of clay minerals and iron oxides in Amarelo Negrais and Encarnadão also makes them more susceptible to alterations, those varieties have a slight increase in porosity. They show intense discolouration and loss of components, especially when used on floors and external applications. Because of that, nowadays this stone is mainly used inside the constructions.

When applied outside, in ornaments and facades, is observed the presence of black crusts, deposits and soiling due to the polluted environment, microkarst in ornaments and fonts, pitting and biological colonization. Efflorescence and blistering can be seen in buildings, both related to salt precipitation. Fractures and abrasion are frequent on floors and stair steps. When used on floors, Lioz shows discolouration and loss of components, these two are also observed in altars, baptismal fonts and other ornaments. A glossy aspect is present in locals where people tend to touch, as in an 18th century font located in the vestry room at the Santo Antônio Church. Graffiti is a typical deterioration pattern found at Rio's monuments and the attempt to clean it can cause bleaching to the stone's surface. Missing parts usually occur at corners and parapets. The fossils control the differential erosion since they are more resistant to weathering than the matrix. These are more frequent on floors.

Knowing these deterioration patterns and their causes is helpful for future conservation strategies.