DETERIORATION OF SERPENTINITE SLABS IN THE LIFT SHAFT OF THE BUILDING OF THE BANCO DE PORTUGAL IN BRAGA

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A pathologic study was carried out concerning the deteriorations observed in the slabs covering the lift shaft in the second floor of the building of the Banco de Portugal in Braga. Two types of deterioration (flakes and efflorescences) were observed in the serpentinite slabs. In order to establish the causes and mechanisms of stone decay, X-ray diffraction and scanning electron microscopy analyses were performed in the samples of flakes and efflorescences as well as chemical analysis in one sample of ground water. Epsomite and hexahydrite were identified in the samples of flakes and epsomite in the efflorescences.The direct cause of the deterioration of the serpentinite can be attributed to the presence of epsomite and hexahydrite, minerals of magnesium sulphate with different hydration degrees. The variations of relative humidity can be responsible for the transformation of epsomite into hexahydrite and vice versa. The source of the magnesium ion can be the serpentinite, composed by magnesium rich minerals such as serpentine, talc and chlorite, since the level of magnesium in the ground water is too low. The source of the sulphate ion should be attributed to the Portland cement mortar used to attach the slabs. In fact, the magnesium sulphate rich solutions are transferred by capillarity from the mortar through the porous network of the serpentinite, evaporating specially near or at the surface of the slabs, allowing the crystallization of epsomite and hexahydrate responsible for the origin of the flakes and efflorescences.