# Evaluating sulfates and nitrates as enemies of the recent constructions: Spectroscopic and thermodynamical study

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# Abstract

Salt crystallization is one of the major problems currently faced by the field of architecture and construction. Its effects are devastating to the extent that they may even lead to loss of material. Although many innovative and resistant materials have been developed in the last years, in most of the constructions, salt crystallization is a persistent problem. Salts crystallizations are formed by the dissolution and subsequent precipitation of the soluble salts present in the material itself or due to the formation of new ones because of the reaction between original components of the building materials with salts coming from infiltration waters or with acid aerosols present in the atmosphere. Among others, some of the most common salts that can crystallize in the building materials are nitrates and sulfates. Both of them are soluble compounds, which can mobilize throughout the material easily, reprecipitate, and generate volume changes responsible for fissures, fractures, and even the loss of building material. In this work, a specific study of salts crystallizations in a recent construction erected in 2013 in Amorebieta (Basque Country, North of Spain) using a different kind of materials has been studied. The materials affected by salts are joint mortars, which in a first step were characterized by X-ray diffraction and Raman microscopy to determine the mineralogical composition. In a second step, a soluble salts tests by ion chromatography was applied to approach quantitatively the impact of the salts. Finally, in a third step, the reactions that give rise to the decay products (thenardite, nitrocalcite, and/or epsomite mainly) were proposed and confirmed through a thermodynamic modelling

Keywords:

mortars, nitrocalcite, soluble salts, thenardite, trona