Study of buildings affected by salt-deterioration processes in Urcuquí and near villages, Ecuador

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The adverse effects of salt growth have been observed across Ecuador. The deterioration of building materials due to this phenomenon can lead to aesthetic and structural damage and, in severe cases, even collapse. This problem affects the communities distributed for Imbabura Global UNESCO Geopark and increases the owner's expenses to remediate it. The study focused on characterizing and evaluating the damage caused by salt growth on civil structures, identifying the predominant salt mineral, and classifying the types of deterioration in Urcuquí town and surrounding communities. The methodology consisted of two main steps: fieldwork and identification of mineral phases. First, the level and type of deterioration were characterized, and 24 samples were collected from civil structures where damage was evident. To ensure accurate results, it was necessary to avoid extracting pieces of building material during the sampling. Subsequently, the results obtained by the X-ray diffraction technique provide valuable insights into the nature of mineral phases and their contribution to the overall deterioration process. The phases identified were sulfates, silicates, carbonates, nitrates, and borates. The most frequently detected mineral was sodium sulfate (23 samples), a mineral component known as thenardite (Na_2SO_4). This salt is responsible for structural damage due to its crystallization. The analyzed structures showed damage mainly at their bases, which can be traced back to capillary absorption and water trapping due to the absence of protection from rainwater and other weathering factors. Lack of maintenance and care leads to significant deterioration of abandoned buildings, such as structural damage, decay, and degradation of interior and exterior surfaces. This deterioration provides a real-life example of what happens when damage is left unresolved and when certain building materials are used. Without regular upkeep, the deterioration process can accelerate, leading to potentially hazardous conditions for those who may come into contact with a building.

Keywords:

Salt minerals, deterioration, X-ray diffraction, building material.