



Stone alterations in Zinciriye Madrasah

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Keywords

Mardin
Zinciriye Madrasah
Stone Alteration
Types of Alteration
Traditional Stone Buildings

Abstract

The durability of the stone used in traditional buildings is important in the survival of the buildings to the present day. Changes occur over time on the surface of the stone, which is faced with environmental and climatic effects. The causes, processes and solution proposals of these changes are important for the building to survive for a longer period of time. In this context, it is aimed to examine the alterations occurring in Zinciriye Madrasah. In this framework, the alterations on the facades of the building were determined and classified as physical, chemical, biological and anthropogenic alterations. The distributions and ratios of the alterations on the facades were analysed in order to provide a basis for repair projects.

Introduction

Mardin has hosted different cultures, civilisations, peoples, languages and religions due to its geographical location [1]. In this process, mosques, madrasahs, mansions, churches, monasteries and tombs were built by different societies in the city. Some of these structures have survived to the present day with the same function [2]. Among these buildings, madrasahs operated as educational and cultural institutions [3].

Limestone was used in traditional stone buildings in Mardin. Due to its structure, limestone undergoes changes when exposed to internal and external factors [4-7]. It is important to identify the changes, investigate the causes and take precautions in order to transfer the buildings to future generations [1]. In this study, it is aimed to provide a basis for the determination of alterations in Zinciriye Madrasah in the process of preparing repair projects, their causes and taking measures [8].

Material and Method

In this study, the alterations on the facades of Zinciriye Madrasah in Mardin were analysed. The alterations occurring on the stone surface were analysed and their causes were determined. The study covers the alterations on the south, east and west facades of the building [8]. The changes in the structure were classified and analysed as physical, chemical, biological and anthropogenic changes [9].

Results and Discussion

The main construction material of Zinciriye Madrasah is limestone. When limestone is faced with environmental and climatic factors, degradation occurs on the surface of the stone [10]. These deteriorations change the internal structure of the stone. These changes in the stone cause alterations and in some cases accelerate the process of other alterations [11]. The alterations in Zinciriye Madrasah are classified as physical, chemical, biological and anthropogenic alterations [9].

The physical alterations caused by environmental and climatic effects are shown in Figure 1. Capillary cracks (Figure 1a), joint losses (Figure 1b), surface loss (Figure 1c) and fragment losses (Figure 1d) were observed on the facades of the building. These observed degradations negatively affect minerals that increase strength and facilitate physical decomposition [12].

Chemical changes are the type of deterioration that occurs on the surface of the stone as a result of atmospheric events. Salination and colour changes in the structure due to climatic factors are shown in Figure 2. Salination caused by the dissolution and evaporation of salts in limestone under the influence of humidity and temperature (Figure 2a and 2b) and discolouration caused by the interaction of minerals in the stone (Figure 2c and 2d) were observed.

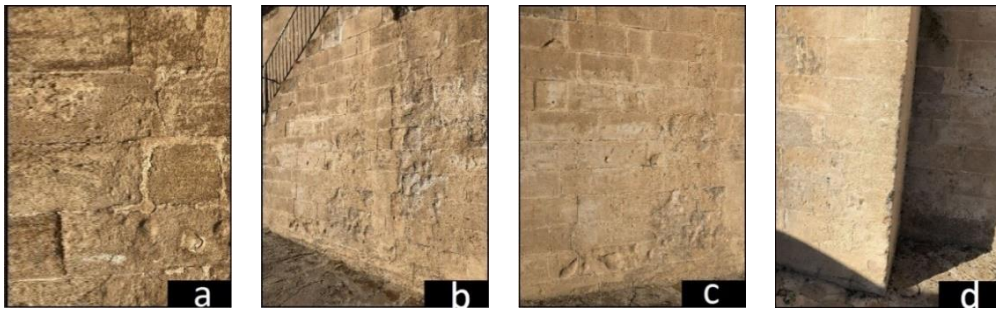


Figure 1. Physical alterations at Zinciriye Madrasah (November 2019)

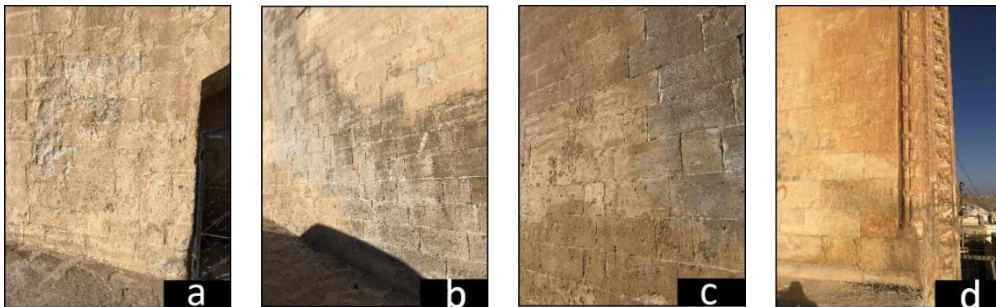


Figure 2. Chemical alterations at Zinciriye Madrasah (November 2019)

Biological changes in the structure are shown in Figure 3. Plant formations are observed as a result of the interaction of the seeds that settle in the capillary cracks with water [13]. Flowering was observed on the south façade of the building (Figure 3a, 3b and 3c) and mossing was observed in the inner courtyard of the building (Figure 3d).

Anthropogenic alterations in the building are shown in Figure 4. The use of paint on the south façade (Figure 4a) and misuse of stone on the staircase (Figure 4b) were observed.

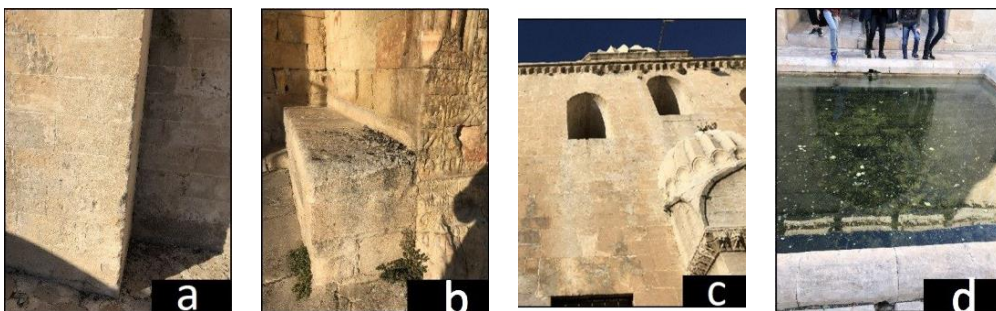


Figure 3. Biological alterations at Zinciriye Madrasah (November 2019)



Figure 4. Anthropogenic alterations at Zinciriye Madrasah (November 2019)

Conclusion

In this study, the alterations that occurred in Zinciriye Madrasah were analysed. These alterations were determined as a result of visual analysis and then grouped into certain categories. According to the grouping, it was determined that the most common type of alterations occurring in the structure is chemical alteration and the least common type of alteration is biologic alterations.

When the alterations in Zinciriye Madrasah were analysed, it was observed that chemical alterations were the highest and biological alterations were the lowest. Physical and chemical alteration types were observed on the south, east and west facades of the building. It was determined that the amount of missing in the madrasah was higher than plant formation. In addition, incorrect stone usage and paint usage were found on the south façade of the building (Table 1).

Table 1. Alterations on the facades of Zinciriye Madrasah

Zinciriye Madrasah	Physical Alterations				Chemical Alterations			Biological Alterations		Anthropogenic Alterations		
	Abrasion	Capillary Crack	Joint Discharge	Part Breakage	Colour Change	Salinisation	Bacteria	Plant Formation	Moss Formation	Sharp Tool Use	Paint Usage	Incorrect Stone Use
South Façade	+	+	+	+	+	+	+	+	-	-	+	+
East Façade	+	+	+	+	+	+	+	+	-	-	-	-
West Façade	+	+	+	+	+	+	+	+	-	-	-	-

The data obtained from this study should be utilised in order to provide effective solutions for building conservation projects planned in the coming years. In order for a building to survive for a longer period of time, it is important to take necessary measures to slow down or stop structural alterations in buildings. In order for the buildings to be transferred to future generations, it is of critical importance to correctly identify and evaluate deterioration and to establish improvement techniques.

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