



THE MICROSTRUCTURAL PROPERTIES OF PLASTER COMPOSITE PRODUCED DURING PRE-REPUBLIC AND EARLY REPUBLIC PERIODS IN DEMIRCI

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Abstract:

Structural plaster properties of the residence type buildings that were constructed during pre-republic and early republic periods in Demirci were investigated within the scope of this study. Samples taken from the existing structures were dried in laboratory conditions and made ready for micro-structure examination. Proper samples were examined with scanning electron microscopy (SEM) with the sensitivity of 5 nm and a magnification of 20.000 times, and the optical microscope (magnification: 250 x). In the light of obtained results, it has been determined that the microstructure of the composite used in the Demirci county in the pre-Republican period and early republic period is similar to the resultant of mixes produced with the modern fiber added composite production technology. It is thought that this study will contribute to the study of the production of the related building materials to be improved in the future within the limits of the district.

Keywords: Mortar; Micro Structure; Micro Structure; Demirci Plaster Type.

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1. Introduction

Plaster composites have been widely used as an architectural and decorative element in the buildings since the ancient times due to relative low cost, easy handling and tolerated mechanical behaviors. Chemical and physical properties of the plaster were studied in many researches in the literature [1,3]. The basic form of the plaster is the plane types that are commonly preferred by the constructors and architectures. Plaster can be worn-out with the effects of many factors such as moisture, air pollution and the temperature changes. These effects result in major changes of physical and structural properties of the plaster [4].

Many technical and scientific researches have been focused the practical problems like proper structural composition, durability, and the restoration processes [5-7]. For the restoration and the related works, it becomes as an important issue to analyze the main components of construction materials to repair the damages. The proper and effective mixes can be prepared with the aid of the physical and chemical analysis [4].

The addition of fibers into a composite mix generally improve its some mechanical properties, especially to flexural stresses resulting cracks. And brittleness can be reduced by reinforcing with the addition of fibers and some mineral particles [8-10]. Fiber effect on the brittle materials has been widely known and practiced for ages.

In the present paper, structural properties of the plaster produced during the pre-republic and early republic periods in Demirci (Fig 1.) was investigated. It is thought that this study will contribute to the study of the production similar building materials to be improved in the future within the limits of the district.

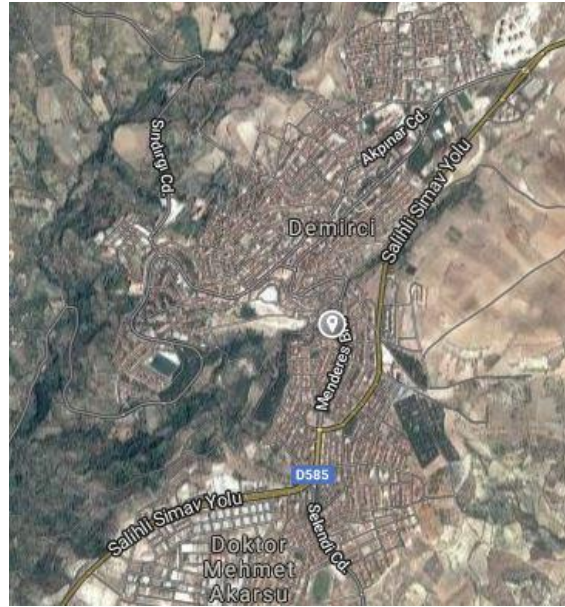


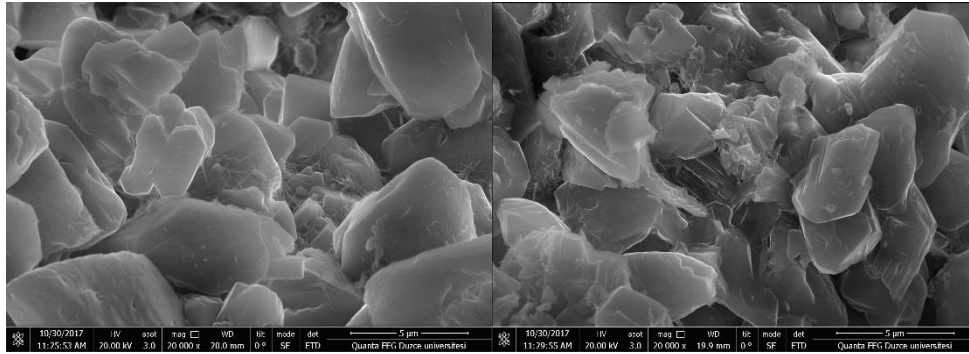
Figure 1: Demirci, Manisa, Turkey

2. Materials and Methods

The plaster samples were taken as facade remnants from four different building which were constructed during the pre-republic and early republic periods in Demirci. The specimens were dried under the laboratory conditions and made ready for the examinations. Scanning electron microscopy (SEM) with the sensitivity of 5 nm and a magnification of 100.000 times, and the optical microscope (magnification: 250 x) was used during the analysis. The maximum magnification used as 20.000 x within the scope of this research. Following the analysis process, obtained SEM and optic microscope pictures were evaluated.

3. Results and Discussions

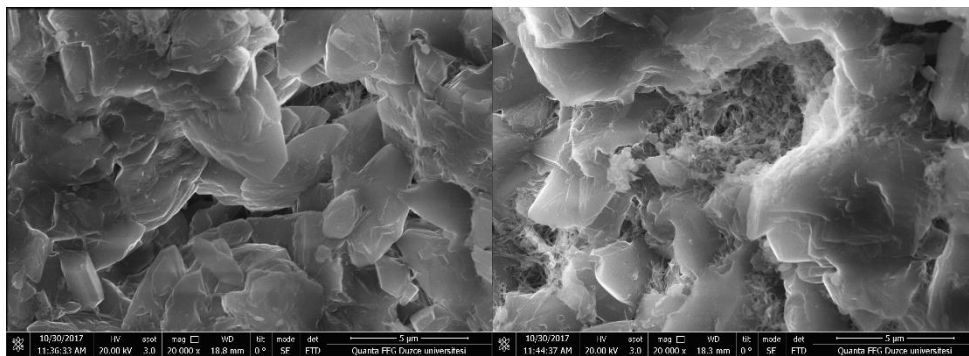
Fig. 2., Fig. 3. and Fig.4 illustrate SEM imaging of plaster samples. Particles generally have irregular shapes except the samples 5 and 6. The structure in Fig. 4. illustrates SEM images of the early republic period construction technology.



a) Sample-1

b) Sample-2

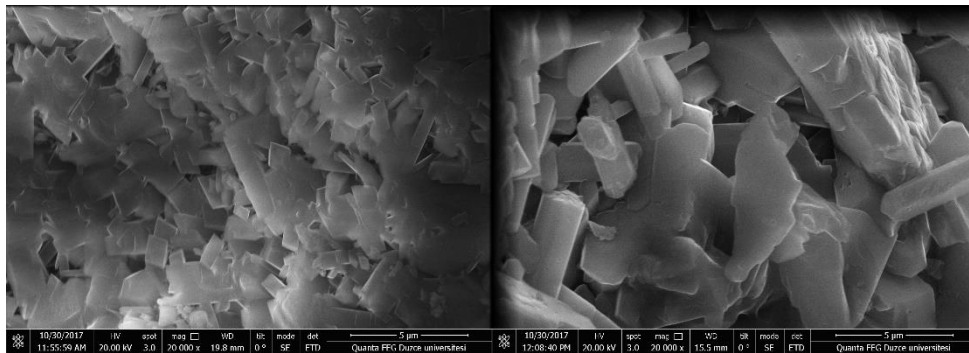
Figure 2: SEM images of the Sample-1 and 2



a) Sample-3

b) Sample-4

Figure 3: SEM images of the Sample-3 and 4



a) Sample-5

b) Sample-6

Figure 4: SEM images of the Sample-5 and 6

Sample-5 and sample-6 SEM results showed the Ca originated material existence (needle-like structure) in the structural composition of matrix material compared to the similar literature researches [11]. The images are also differed in shapes and it was obtained that there is slight change in regularities of the particles, when compared the pre-republic and early republic periods.

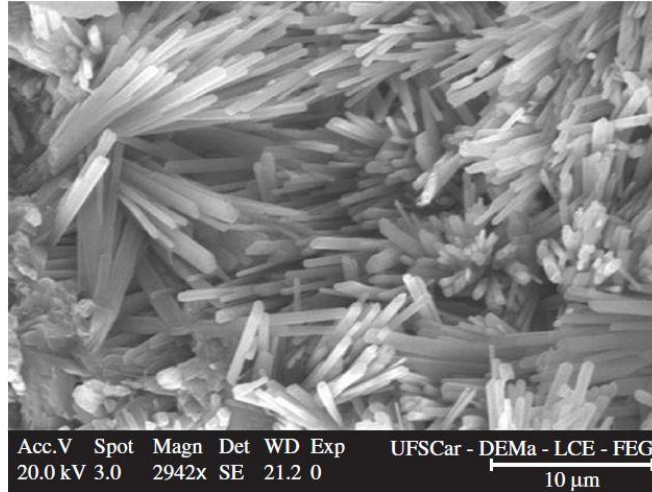


Figure 5:Literature comparison SEM image [11]

The overall rigidity of the obtained structures decreased from pre-republic to early republic depending on the production technologies and the plaster content, when analyzed in a macroscopic point of view.

The optic microscope analysis result (Sample-5) was given in Fig. 6. As seen in Fig. 6, crack path ended in fiber surface. Fiber addition stopped the forming and widening of the cracks. This finding is consistent with the reported fiber added material researches and the related practices. The optic microscope analysis enhances the ability for characterizing microstructure of the plaster samples and evaluating the fiber addition effects.



Figure 6: Crack path

4. Conclusions & Recommendations

The conclusion of the conducted analysis can be presented as follows:

Be sure to avoid over-interpreting the results and make general conclusions that cannot be justifiably derived from the parameters of the study. Discuss any implications and limitations of

the study as well as to what extent the conclusions are in concert with other researchers. The main results should be presented clearly and briefly, insisting on their significance and degree of novelty.

This section may also include also include discussion on theoretical and methodological implications of findings.

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