

Geochemistry and mineralogy approaches to characterize brick and its lake sediments sources: Antioch Roman City (Southern Turkey)

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The Roman aqueduct of Antioch-on-the-Orontes (Southern Turkey) is situated close to the Antioch city. This last is located near the Amik Lake (Lake of Antioch) and close to the junction between the active Dead Sea fault and the East Anatolian fault. During the Roman period, the Amik Plain was more densely occupied than at any time in its history [1]. The study focuses on the bricks and the lake sediments characterization in order to determine the source area as well as the technical production used at this period. For this purpose, several bricks were sampled on different parts of the city's aqueducts. Furthermore, a core of about 6 m of sediments was also collected from the dried Amik Lake. The bricks were characterized through a mineralogical (XRD) and chemical (PIXE-PIGE) approaches. Unfired clay fraction remained as inclusion in the brick was separated and then analysed using XRD. Geochemical composition and clay mineralogy were performed on the raw sediments from the Amik Lake in order to compare the source area. Technological test will be performed on the raw clay sediments from the Amik Lake in the purpose to understand the production techniques used at this time. The age of the brick production was previously dated to the Roman Period [2]. The synthesis of all the data attested the Amik Lake sediment as the raw material for the bricks of the aqueduct. Clay mineral composition from the Roman period deposited in the lake is smectite, illite, kaolinite and small amount of mixed-layer clays. The similar clays composition is found in the remained clays on the brick used for the aqueduct construction. Fast and heterogeneous firing practice characterized the manufacturing of these materials due to the rapid need for the materials during the post-seismic repairs after earthquakes that are mentioned in historical written works.

[1] J. Casana, *Geomorphology*, **101**, 429-442 (2008)

[2] Y. Benjelloun, J. de Sigoyer, J. Carlut, A. Hubert-Ferrari, H. Dessales, H. Pamir, V. Karabacak, *Comptes Rendus Geoscience*, **347**, 170-180 (2015)