Journal of Research on
Archaeometry

DOI: 10.29252/jra.3.2.45

URL: http://jra-tabriziau.ir/

Original Paper

Preparation of Thin Sections of Porous Materials for Polarizing Microscope Investigation in Archaeometry

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Received: 26/02/2016 **Accepted: 03/05/2016**

Abstract

Thin section petrography is a knowledge based on a study of stones and minerals with polarizing light of a transmitting optical microscope, that is a standard scientific method for mineralogy, petrology, geology and etc. Researchers with this method can gain supplementary or fundamental information. Thin section making technique was developed by geologists for the study of rocks. Using the thin section for the study of cultural heritage has more than one century old. Thin sections take into consideration from a basic analysis for use to examine a wide variety of Archaeometry-archaeological survey and also conservation and of historical materials for characterization, determining sources and provenance, pathology and evaluation of the conservation treatment effect on inorganic materials (such as: rocks, historical slags, mud brick, plaster, pottery and ancient mortars).Thin sections use for petrological and mineralogical survey are made in different sizes by using different techniques for curing, polishing and staining small slabs of a rock sample,normally thin sections made by reducing the thickness of small fragments of materials that attaching the flat surface of glass microscope slide (with size of 47×26 mm) by sawing and grinding to standardthickness (25-30μm),at this thickness most mineral s (e.g. silicatestypically quartz is used as the reference to determine standard thickness as it is one of the most abundant minerals) becomes more or less transparent and can then be observed by a microscope using transmitted light and then using the Michel-Lévy interference color chart to recognizing the minerals and their structural aspects (cleavage, fractures, mineral zoning).On one hand when the ordinary methods of making thin sections applied to other materials that are soft, heat sensitive, and/or water sensitive, thin section preparation presents considerable challenges for the technician and On the other hand, according to the limitation of sampling in the case of the cultural heritage of artworks and historical objects, as we know the Archaeometry researcher most be using the minimum sample for answer the questions, Since due to the importance of saving the small and also weak samples from cultural heritage a description of preparing thin sections to Petroghraphic microscopy investigation in Archaeometry is the main purpose of this paper. Samples for this study were a kind of weak Tufa from the regions near the Alcala Del Jucar city of

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Valencia /Spain and also from the powdered surface of rock-hewn architecture in Kandovan Historical village from Northwest of Iran. All process for preparing the thin sections were in the petrology Lab of Geosciences and environment department from the university of Alicante/SPAIN and petrology laboratory in earth and environmental sciences department from Università degli Studi DI Milano-Bicocca, Italy. This article has been prepared in 6 essential steps, including by: 1) sampling strategy and specimen preparation, 2) preparing the samples for cutting process, 3) cutting of the fragments (consist of: hard, soft and powder materials) and making the slide, 4) impregnation techniques with a resin, and attach the slide to glass, 5) reduce the thickness of slide till standard size with sawing and grinding methods in three phase from cm to μm, and finally 6) decision making to add the protective cover for slide in the stone face plus preserve of thin section, equipments of petrography lab. the results of this study with emphasize to soft materials specialty in cultural heritage and Archaeometry demonstrated that: some steps like sampling and impregnation is very important to make high quality thin sections; consolidation and saturation of fragments with vacuum methods in two steps before any cutting can be a suitable way for materials like soft stone, weathered stone, fragile potteries and historical mortars to preparing a thin sections.

Keywords: Archaeometry, Thin Section Preparation, Mortars, Pottery, Soft & Weathered Rock.