

## **Review on Gilding Methods of Ancient Metal Artifacts**

**Mohammad Mortazavi\***

Assistant Professor, Faculty of Conservation, Art University of Isfahan

**Mohammad A. Golozar**

Professor, Isfahan University of Technology

**Ahmad S. Kakhki**

Associated Professor, Faculty of Conservation, Art University of Isfahan

### **Abstract**

The gold always was used as a symbol of power and wealth during the time in the old and now. Since the discovery of gold, it has been used either as a substitute for making metal objects or coating and gilding all or part of objects surface. Main three methods of metal gilding included; foil gilding, leaf gilding and amalgam gilding which each of them have been performed in various techniques. Investigation of gilding methods beside evolution process of these methods which have occurred along with development in extraction knowledge and, in particularly, gold purification leads to accurate perception in history of gilding. Base on, gold foil has been used in 3000 B.C for gilding so long as invention of gold purification in 2000 B.C. So, after that, gold leaf was produced and the other technique of gilding was applied. Understanding different methods of gilding increase our perception from evolution and development in gold metallurgy. Hence, in this paper different gilding methods of historical metal artifacts were reviewed.

### **Key words**

Amalgam Gilding, Archaeo-metallography, Foil Gilding, Gold, Metal Gilding Artifacts

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\* Correspondent: m.mortazavy@au.ac.ir

## **Technological and Diagnostic Study of a Tapestry from the Collection of Niavaran Palace**

**Mina Nazer\***

Iranian Cultural Heritage, Handicrafts & Tourism Organization,  
Tehran

**Mohamad Mortezaei**

Assistant Professor, Iranian Cultural Heritage, Handicrafts &  
Tourism Organization, Tehran

### **Abstract**

The present essay is the result of examining the tapestry textiles in general and some of the existing tapestries in the Niavaran Palace's museum. Due to lack of sufficient knowledge about this art in Iran, the protective measures towards these works are inappropriate and inconsiderable. These methods, which are applied concerning the other Iranian textiles too, have brought irreparable damages to these works. Study and analysis of these works can be considered from three aspects of historical, artistic and structural in general. This essay's discussion is focused on the latter that is the study of the structure of these works, which its ultimate purpose and result is to propose a plan for protection and renovation of this kind of textile. The tapestry technical studies not only prepare the way for proposing a plan for protection and renovation, but also promote the predecessors' textile art; therefore, the understanding of its technical specifications can make a positive effect on the weaving industries. Achievement to this goal certainly requires a precise, pathological and technological studies (based on the laboratory methods). Thus, this essay intends to fulfill this goal.

### **Key Words**

Fibers, Pathology, SEM analysis, Tapestry, Technology

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\* Correspondent author : [nazer.mina@yahoo.com](mailto:nazer.mina@yahoo.com)

green pigment, vermilion pigment and indigo dye, and performance oil gilding Technique, are the achievements of this research.

**Keywords**

Intonaco, Layer of paint, Gilding, Mural, Rokn Al-din Mausoleum in Yazd

## **Investigation and Technical Study of Layers of Mural Painting in Seyyed Rokn Al-din Mausoleum in Yazd**

**Yasser Hamzavi\***

Instructor, Department of Conservation, Tabriz Islamic Art  
University

**Rasool Vatandost**

Assistant Professor, Iranian Cultural Heritage, Handicrafts &  
Tourism Organization, Tehran

### **Abstract**

Arabesque, Angelica and geometric patterns are the most common architectural decoration (Murals) of Al-Muzaffar local government in Yazd. Among the Yazd monuments, Sayyed Roknoddin Mausoleum has unique murals. With Considering the Ilkhanid era as a golden age of Persian art and architecture among other Islamic countries, it should be stated that very little effort has done on studying mural painting materials and techniques of this luminous time. Despite of processing of the stucco layers with high consolidation and also very high precision which is approximately 1- 2 mm in diameter, As well as identifying some of the pigments and the method of gilding on flat surfaces are the uncertainties of this research. The method of investigation was explained below: wall painting observed at the location and take images with digital microscope in magnification 65X and 220X, and Sampling of the various layers of mural were initial actions. for identification of inorganic materials of mural layers, XRD (X-ray diffraction), EDX (Energy Dispersive X-ray microanalysis) and wet chemical analysis, and for microscopic image, SEM (Scanning Electron Microscope) have been utilized. Also In some cases heat test was performed, then the results of these studies has been analyzed in this paper. Multiple layers of fine coat, the use of gold leaf, slow-setting gypsum Plaster and fast-setting gypsum Plaster in layers of fine coat of mural, and the use of earth

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\* Correspondent author: [y.hamzavi@tabriziau.ac.ir](mailto:y.hamzavi@tabriziau.ac.ir)

## **A Critique on Conservation and Restoration of the Masjid-i- Muzaffariyya Decorations, Tabriz, Iran**

**Saeed Mehryar\***

Iranian Cultural Heritage, Handicrafts & Tourism Organization,  
Tabriz

**Mehdi Razani**

Instructor, Tabriz Islamic Art University

### **Abstract**

Masjid-i Muzaffariyya or 'Blue Mosque' in Tabriz with carving stones and tile masterpieces is one of the main buildings belong to the 15th century in northwest of Iran. The main damages to the Blue Mosque are attributed to an earthquake in 1780. Unfortunately additional restoration of that have destroyer anxiety in visually and finding the atmosphere due to heterogeneous of the methods of conservation in interior and exterior decoration part, that took place by conservation of historical artifacts organization the extensive rebuilding between 1950 and 1966 before Iranian revolution and also cultural heritage organization in 1990s. In this paper we investigate the restoration architectural decorations with the use of field works and documentational Information; the results of this research show that: Unbalance and non stylistic unity in restoring efforts to architectural decorations focused speciality in tiles and carving stone. Therefore, it seems that in comprehensive conservation plan of this building, preference of reconstructions and conservation schemes must focused to observe the removing of existing anxiety and non-stylistic unity.

### **Keywords**

Architectural decorations, Blue Mosque, Tabriz, Conservation & Restoration, Masjid-i- Muzaffariyya.

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\* Correspondent author: saeed\_mehryar\_es@yahoo.com

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quality of stone improved, finally epoxy resin improved %17 the properties, compared to other materials for consolidation epoxy is better evaluated, but due to Incompatibility physicochemical properties between resin and stone in addition low penetration depth, it is superficial coating and must be periodically renewed.

**Keywords**

Lomashell Stone, Consolidation, Limewater, epoxy resin, alkaline micro-organisms

## **Evaluation of Consolidation Methods to Improve the Durability Properties of Carbonate Lomashell Stone**

**Ehsan Mohamadi\***

Faculty of Mining Engineering, Isfahan University of Technology

**Alireza Baghbanan**

Associated Professor, Faculty of Mining Engineering, Isfahan

University of Technology

**Farshad Ramezani Far**

Faculty of Mining Engineering, Isfahan University of Technology

**Hamid Hashem Alhosaini**

Associated Professor, Faculty of Mining Engineering, Isfahan

University of Technology

**Mehdi Razani**

PhD candidate Art University of Isfahan / Instructor Tabriz

Islamic Art University

### **Abstract**

According to accessible materials, porous Lomashell stone has been used in many structures and stone monuments in south coasts of Iran, this type of carbonate stone mostly has a poor physical and mechanical properties and it is generally unsuitable for building structures, since consolidation and retrofitting this stone is very important for application as a material in the buildings. this research was done with sampling as a field work from Holor mine in Dargahan from Northeast of Qeshm Island/Iran, Rock samples for bearing the consolidation process were divided into two categories: 1) untreated stone, 2) treatment stone with consolidations; include: A) Lime water, B) Epoxy resin, C) biogrout. the results of engineering durability tests include: physical properties, Slake durability (chemical and mechanical) shows that: lime water due to high water content causes the texture decay with decreasing %8.5 of mechanical properties then untreated samples, bio-consolidation with biogrout causes reducing the water absorption and %7 the

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\* Correspondent author: mohammadi\_iut@yahoo.com

## **The Necessity of Applying Decay Mechanisms Investigation in the Rock Hewn Architecture of Kandovan; a Historical Village in Azerbaijan, Iran**

**Mehdi Razani \***

PhD Candidate in conservation, Art University of Isfahan /  
Instructor Tabriz Islamic Art University

**Seyed Mohammad A. Emami**

Associated Professor, Faculty of Conservation, Art University of  
Isfahan

**Alireza Baghbanan**

Associated Professor, Faculty of Mining Engineering, Isfahan  
University of Technology

### **Abstract**

Kandovan historical village, vicinity of Osaka town is one of the most important attractive sites in east Azerbaijan province that because of the hewn-cut house from rock skirt of Sahand volcano that registered in 1998 on the national cultural heritage list of Iran. Kandovan rocky architecture in geological point of view is on the surfaces of thickness Ignimbrite layer that due to natural weathering and erosion along the main Joints and discontinuities of Kandovan valley creating conical Forms and structures. According to the existing theory, Kandovan village was residential and people lived in these conical structures since the Ilkhanid era. Nowadays, with increasing of weathering of these volcanic masses, some rocky houses become inappropriate for living and people just completely left or used as a seasonal residence during the summer. Hence, knowledge about decay mechanisms of stone beside of determining the method for conservation is necessary to find proper methods and prioritization of the conservation.

### **Keywords**

Decay Mechanism, Conservation and Restoration, Kandovan Village, Rock-Cut Architecture, Volcanic tuff

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\* Correspondent author: m.razani@tabriziau.ac.ir



## **Investigation and Feasibility of Using honey Natural Corrosion Inhibitor in Conservation of Bronze Objects**

**Vahid Poorzarghan**

Faculty of Art and Architecture, of Conservation, Zabol  
University

### **Abstract**

Bronze disease is one of the most deteriorating phenomena in historic Bronze artworks and many different methods are reported to treat it. The most reported corrosion inhibitors against it are BTA and AMT. These constraints during inhibitory control are toxic and carcinogenic, In this study, to overcome such problems, a natural inhibitor at concentrations of 1200 ppm to 2000 ppm acacia in corrosive environment sodium chloride 05/M on bronze alloy of ancient alloys similar to (Cu-10Sn) Potansioestat polarization method, weight loss method and humidifier area to evaluate. The results of the data show that the inhibitory effects of honey on ppm1800 concentration of corrosive environments. Images and SEM-EDX analysis results indicate the effectiveness of the deterrent.

### **Key words**

Corrosion, Bronze Disease, Natural inhibitors, Honey, Potansioestat, SEM-EDX

## **Tracing Manufacturing Technique in the Microstructure of Archaeological Metals**

**Mohammad Mortazavi\***

Assistant Professor, Faculty of Conservation, Art University of Isfahan

### **Abstract**

Archaeometallurgy is the field of research in history with the aim of obtaining information about ancient metallurgy. For this issue, different metallurgical evidence like metal objects and related material (i.e., crucibles, slags, furnaces) as well as tools are studied. Metal artifacts which have survived over time contain evidence of the early technologies which recorded in their microstructure. Metallography is used as a method for studying and tracing manufacturing technique of metal objects. Results of metallographic study increase our understanding from the past by information about material, producing processes and smelting. Hence, in this paper the abilities of metallography to identify the technology of metalworking in ancient time have been review in historical samples of copper and copper alloys, iron, tinned copper and gilded metals. Accordingly, evidence presence in microstructure of ancient metal were divided to matrix, inclusions and slags, decorations and surface treatment, porosity, joining techniques and corrosion. Then characteristics of each one for identification of alloy composition, manufacturing technique, heat and mechanical treatment, coating and finishing was investigated.

### **Keywords**

Ancient metals, Archaeometallurgy, Manufacturing techniques, Metallography , Microstructure

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\* Correspondent: m.mortazavy@au.ac.ir

## **Analytical Methods for Binding Media in Paintings Review**

**Amir H. Karimy\***

Assistant Professor, Faculty of Conservation, Art University of  
Isfahan

**Reza Vatankhah**

Assistant Professor, Faculty of Conservation, Art University of  
Isfahan

### **Abstract**

This is a review of classical chemical and instrumental analysis of binding media in paintings. Methods like FTIR, Raman, and SIMS spectrometers plus separation methods of TLC, HPLC, and GC along with immunoassay and biological techniques of ELISA and IFM are considered in this study. Systematic characterization of binding media has two main steps. In first one main group of carbohydrates, proteins, oils, and waxes are identified and then further details in each group are attainable using one of the above mentioned analytical techniques. In this document each technique is explained briefly and its advantages and disadvantages are listed. Consequently, it would be possible to select a proper technique to characterize certain binding media in a specific condition.

### **Keywords**

Binding media, Carbohydrate, Chromatography, Oil, Protein, Spectroscopy, Wax

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\* Correspondent author: ahkarimy@gmail.com

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diagnostic did the electrochemical methods can use as the assessment tool for checking the museum environment. In this paper suggestion importance strengths and advances and defects the electrochemical methods in the field of conservation and restoration of metal artifacts. The aims of this article are introducing the approaches to these methods.

**Keywords**

Artifacts, Conservation, Corrosion, Electrochemistry, Restoration

## **Review on the Applications of Electrochemical Methods in Restoration and Conservation of Cultural Properties**

**Hamidreza Bakhshandehfard\***

Assistant Professor, Faculty of Conservation, Art University of Isfahan

### **Abstract**

Conservation is one of the interdisciplinary sciences that are indebted to others. One of them is Electrochemistry ways. Electrochemistry methods have a significant role in conservation and restoration of ancient artifacts. Briefly, we can divide the application of these methods to examination of materials, restoration and cleaning and investigation of environmental conditions in cases and depot in museums.

Identification of Constituent Material:

This method is one of the most important aspects in scientific investigation in metal artifacts as; we know some of relics are complicated. And some of them are homogenous and some of them are not. For example paint, pigment and so on. It is probably electrochemistry methods can do these jobs without damaging.

Cleaning and Restoration Methods:

Electrochemistry methods are used in metal artifacts treatment for one century. Maybe it is ideal to reverse the corrosion phenomena in metal artifacts. But the application of these methods is to treatment the artifact properties towards the conservation and strengthened of them.

Investigation of Environmental Conditions:

Scientists and researcher are checking the environmental condition in museum, because contaminants cause deterioration in artifacts. Identification and determination of these component for sensitivity and expensively is impossible. Besides usual ways of identity cannot diagnosis the rate of deterioration. Because effects of synergetic in artifacts cannot

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\* Correspondent: [hr.bakhshan@au.ac.ir](mailto:hr.bakhshan@au.ac.ir)

## **Fake and Forgery in Antiquities and Visual Arts: Terminology, Typology, Legal Fate and Evaluation Methods**

**Mehdi Razani \***

Instructor, Department of Conservation, Tabriz Islamic Art  
University

**Behnaz Nasirzadeh**

M. A. in Criminology, Visiting Instructor in Department of  
Conservation, Tabriz Islamic Art University

### **Abstract**

Different types of forgery have a long history of human life. However, making the art forgery and false-imitative objects with today meaning related to Renaissance movement and continued on Enlightenment, since museums, collections and collecting heritage foundered and managers and owners tried to collect ancient civilization artifact or artistic objects (old painting, sculptures, documents, etc.) for filling their museums, That time was a good opportunity for skilled forger to make fake objects and sell it. These processes due to now, the majority of museum and collection have a lot of forgery artifact. Now all of museums and collections belong to cultural heritage organization of Iran have great problem about unoriginal objects, this paper will be done to explain compendium customary terminology and the typology of art forgery in and structural cultural heritage organization and also Legal Fate and Evaluation Methods to contiguity by unoriginal artifacts.

### **Key words**

Antiquities, Cultural properties, Forgery, Fake, Visual Arts

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\* Correspondent author: [m.razani@tabriziau.ac.ir](mailto:m.razani@tabriziau.ac.ir)

## **Principles of Dendrochronology in the Study of Ancient Artifacts**

**Mohsen M. Achachiluei\***

PhD Candidate in conservation, Faculty of Conservation, Art  
University of Isfahan

**Mohammad M. Deldar**

M. A. in Conservation, Tabriz Islamic Art University

### **Abstract**

Dendrochronology is the science for investigation of information in tree rings, regarding to growth patterns of exact species in defined geographical origin. It includes answers to environmental and historical questions. Dendrochronology has different subdivisions such as dendroarchaeology. It used to determine the exact time which timber has been felled, transported, processed and used for different artifacts .It is possible to date the wood with appropriate accuracy ( $\pm 1$  year) according to environmental and climatic effects on the width of annual rings during the time. This dating method has been used in different parts of the world. Differences between growth conditions confine the method to geographical origin of wood. Dating of archaeological samples relies on characterization of growth patterns during different periods. Reaction wood, false rings, missing rings and deterioration effects should be considered. Growth patterns of wood during different historic periods have not been studied in Iran. Floating chronologies would be suitable for dendrochronological studies in the field of archaeometry in Iran. Floating chronologies can be used for identification of wood origin in the historical artifacts.

### **Keywords**

Ancient artifact, Archaeometry, Dating, Dendrochronology, Wood

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\* Correspondent author: mohsen.mohammadi@au.ac.ir

**Preliminary Studies of Geoarchaeology on Earthen  
Masonry Materials (Case study: investigation of  
applied materials and masonries in historic  
fortress of Toos, Khorasan, IRAN)**

**Moein Eslami** \*

PhD Candidate in Archaeological Sciences, Johann Wolfgang  
Goethe Universität, Frankfurt am Main

**Abstract**

In this article, earthen masonry of historic City of Toos has been studied, to get the archaeological information about technique and construction process. This data helped us not just design a more accurate conservation plan but also prepare us archaeological data. This was a pilot study to evaluate the methodology and possible get data. According to the work plan, this study was start point for a comprehensive study. So the results here are as preliminary report. In this study X Ray Florescence spectroscopy (XRF), X-Ray diffraction (XRD) and soil analysis have been used. The results shows, that probably the sample from different part of the site come from the same construction level. However lack of any control in construction process is evident and could be an evidence of hurry in construction of these buildings. Probably is after a demolishing time. Mineralogical composition of masonry shows also selection of not appropriate clay minerals in row materials, which make a low engineering quality earthen masonry with high erosion rate.

**Keywords**

Geoarchaeology, Archaeometry, Earthen Masonry, Toos, Construction techniques

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\* Correspondent: moein.eslami@stud.uni-frankfurt.de



region show that these mines might have been one of the main raw material sources at this time.

**Keywords**

Achaemenian, Archaeometallurgy, Fars province, Geoarchaeology, GIS, Mining

**Remote Sensing Methods for Investigation and  
Recognition of the Ancient Mining Activities (Case  
study on Cu-Fe-Mn mineralisation in the Western  
Part of the Central Iranian Zone)**

**Seyyed Mohammad A. Emami \***

Associated Professor, Faculty of Conservation,  
Art University of Isfahan

**Bamshad Yaghmaei**

GIS Lab., Tarbiat Modares University, Tehran

**Abstract**

This paper reviews current observations with respect to the GIS database system for ancient mining exploration in the Southern part of Iran, in the Fars region. Special emphasis is given to the complex sulfide ore deposits Jian (Cu+Au+As) and Faryadan (Fe+Mn) mines and the usage of GIS methods as a useful discipline for determining the ancient mining localities. The Jian Copper Mine and the Faryadan Iron Mine are located 120 km north of the Takht-e Djamshid (Persepolis) in the Marvdasht plane. The localities of these mines and the topographic faults of the field are shown by simultaneous visualization of map and DEM (Digital Elevation Methods) data, which have been overlapped in ERDAS software to allow spatial analyses. The maps are collections of elevation lines (contours) and are represented as vector data in digital format. DEM data have been created from the contours as raster data, and these are used for slope, aspect, elevation and view sheet analyses. The location of these mines and slag dumping places and the distinguishing outlook between them proves a relationship between these areas and the ancient monuments in the Fars region in the Achaemenian period (550-330 v. Chr.). The metals which were used in Persepolis and other related areas in this

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\* Correspondent author: emami@chemie.uni-siegen.de

## **Technological and Laboratory Analysis of the Late Bronze Age and Iron Age Pottery Shreds of Tepe Sagzabad, Qazvin Plain, Iran**

**Hassan Talai\***

Professor, Department of Archaeology, University of Tehran

**Ahmad Aliyari**

Instructor, Institute of Archaeology, University of Tehran

### **Abstract**

Ancient ceramics and remains of archaeological excavations are fascinating objects for investigations on their built technology and manufacturing processes. Archaeometrical investigations on ceramics help the archaeologists for a better understanding of the ceramic technology in the prehistoric times. To characterize ceramic matrices some samples of L B A and Iron Age ceramic's body were selected from Tepe Sagzabad (c. 2100-1200 B.C. ). These samples were examined in terms of mechanical strength, chemical, properties, roughness of the surface, thermal strength and tempers. According to the investigations one finds that the built technology and manufacturing processes have been changed during Iron Age . These differences occur mainly on the color of ceramics boundaries. The correlations between built technology and cultural changes during L B A and Iron Age provide the interpretations of certain viewpoint in research on material culture which had the danger of conclusions which were over simplified.

### **Keywords**

Built technology, Iron Age, Late Bronze Age, Pottery shreds, Tepe Sagzabad of Qazvin plain

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\* Correspondent author: htalae@ut.ac.ir

## **A Preliminary Analysis on the Provenance Study of Tepe Boynoo Obsidians by PIXE Method**

**Somayyeh Noori \***

Instructor in Applied Sciences University, Ardebil

**Kamal A. Niknami**

Professor, Department of Archaeology, University of Tehran

**Bahram Ajourloo**

Assistant Professor, Department of  
Archaeometry, Tabriz Islamic Art University

**Mohammad A. Sola**

Instructor in Applied Sciences University, Ardebil

### **Abstract**

This study has created body of reference data for the use of PIXE analysis as a means of enhancing the use of obsidian artifacts in addressing fundamental definitions of group membership. At first from 3 archaeological sites and then from 12 known sites in this study, a total of 41 obsidian artifacts were analyzed to determine the concentration of 7 chemical elements. Bivariate plots and multivariate statistical methods of PCA and LDA were performed on the data set. Statistical tests indicate that there are three groups in the data set which correspond to the site locations. The result shows that obsidian artifacts of each group are statistically similar and it can be said that a common source of raw material was used independently in each of these groups. Both statistical analyses of PCA and LDA applied for differentiate obsidian artifacts showed that all the samples based on their chemistry would be divided into three distinct groups. This finding points to this conclusion that settlements of each group were using the same raw material resources and produced its own obsidian artifacts.

### **Keywords**

Late Neolithic, Obsidian, PIXE analysis, Provenance Study, Tepe Boynoo

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\* Correspondent author: nori@ut.ac.ir

## **Proton Induced X-ray Emission; A Non-Destructive Analysis Instrument in Archaeometry**

**Masoud B. Kasiri \***

Assistant Professor, Department of  
Archaeometry, Tabriz  
Islamic Art University

### **Abstract**

An understanding of the state of materials at a molecular level can provide valuable information for archaeologists and conservators, enabling them to decide on a conservation procedure. This paper describes the principle of the Proton Induced X-ray Emission (PIXE) technique for the trace element analysis. It also describes briefly the ways of sample preparation for PIXE measurement as well as the analysis of spectra obtained. As an example of application, three pictures of Yūsof-o-Zalīkhā book related to Safavid period (Iran, 15<sup>th</sup> century) were analyzed by this technique to find out more about the nature of the blue colors used. The results showed that the nature of blue color in the pictures is lapis lazuli; a widely used blue pigment at that time. This study demonstrated the potential of PIXE analytical method in the realizing the nature of colors in the artworks and understanding the ancient techniques of pigments preparing and the pathology of damages.

### **Keywords**

Iranian Painting, Lapis lazuli, Lazurite, PIXE Analysis, Sample préparation

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\* Correspondent: m.kasiri@tabriziau.ac.ir



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**Mehdi Razani & Bahram Ajourloo**





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