FA2-MS03-P01

Quantitative Phase Analysis of Model Painting Layers: A comparison of X-ray Micro Diffraction with Conventional Transmission and Reflection Geometries. PetrBezdicka[a],EvaKotulanova[a],Mariana Klementova[b]. [a]*Institute of Inorganic Chemistry of the ASCR, v.v.i., c.p. 1001, Husinec-Rez, 25068, Czech Republic & Academy of Fine Arts in Prague, ALMA laboratory, U Akademie 4, 170 22, Prague 7, Czech Republic.* [b]*Institute of Inorganic Chemistry of the ASCR, v.v.i., c.p. 1001, Husinec-Rez, 25068, Czech Republic.*
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Laboratory X-ray micro-diffraction (μXRD) is becoming more widely applied to inorganic phase analysis of art-works samples and there is a growing demand to give relevant answers to questions about the detection limits or whether the quantitative phase analysis (QPA) can also be performed using the micro-diffraction setup.
To be able to give such answers a comparison of the micro-diffraction setup with the most commonly set-ups (reflection and transmission) in the quantitative phase analysis, binary and ternary mixtures of azurite, malachite, calcite and quartz in known ratios were prepared and analyzed. Quantitative phase analysis of all experimental data was done using Rietveld method. It was found that the accuracy of results of quantitative analysis highly depends on the sample preparation. The most accurate results were obtained in transmission geometry.
Model paint layers that simulate typical paint layers of artworks were also prepared. Fragments of these model layers were analyzed by μXRD. The success of micro-diffraction analysis depends markedly on the homogeneity of analyzed layers because of smaller irradiated area. The accuracy of X-ray micro-diffraction on fragments falls in between that of the other two methods performed on powder mixtures. Detection limits of micro-diffraction were studied and it was revealed that approximately 5 weight percent of phase in a mixture is needed both for reliable qualitative and quantitative analysis.

Keywords: micro-diffraction; quantitative phase analysis; art-works

FA2-MS03-P02

Mineralogical and Art-historic Traits in Investigation of 'Anonymous' Paintings. David Hradil[a,b], Janka Hradilová[b], Petr Bezdička[a,b], Jitka Vlčková[c,b]. [a]*Institute of Inorganic Chemistry of the AS CR, v.v.i., Řež.* [b]*Academy of Fine Arts in Prague.* [c]*National Historical Institute, Prague Central Workplace, Czech Republic.*
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The application of modern microanalytical methods in the materials analyses of paintings produce a lot of data with the aim to resolve questions of the painting authenticity, dating or provenance. To be successful, the multidisciplinary approach is needed in fact, combining knowledge of materials, their sources and use, the painting technique and artistic and art-historic evidence. The fingerprinting is necessary instead of excessive collection of data. From the methodological point of view, the mineralogical approach within any provenance study of Old Masters pigments should be specifically underlined. According to our experience the laboratory powder X-ray microdiffraction is a very effective tool for direct phase analysis of microsamples containing crystal constituents with no need of their pre-treatment. For example, the detailed description of different clay minerals structures in earthy pigments is crucial for specifying their natural source and can only be done by the X-ray diffraction methods. When combining the stylistic and material traits we can therefore conclude, for example, that the association of chlorite and dolomite in preparation layers is typical for North Italian paintings, smectites comes more frequently from Mediterranean while kaolinite together with illite are usually related to Mid-European sources. The presence of gibbsite in red clay-based grounds for gilding could indicate either the admixture of bauxite or, more probably, the use of red organic lake precipitated on gibbsite. Red organic lakes as well as cinnabar were added to improve the red colour in the case when the actual content of natural Fe oxides was low. Thus the results of mineralogical and crystallographic analyses contribute significantly not only to the materials provenance determination, but also to the more precise description of the painting technique and its development in the history.

Keywords: materials microanalysis; microdiffraction; historical pigments

FA2-MS03-P03

Practical Realization of Moroccan Geometric Pattern. Youssef Aboufadil[a], Jamal Benatia[a], Abdelaziz Jali[a], My Ahmed Elidrissi Raghni[a], Abdelmalek Thalal[a]. [a]*Department of Physics, LSM, Faculty of Sciences-Semlalia-Marrakech-Morocco.*
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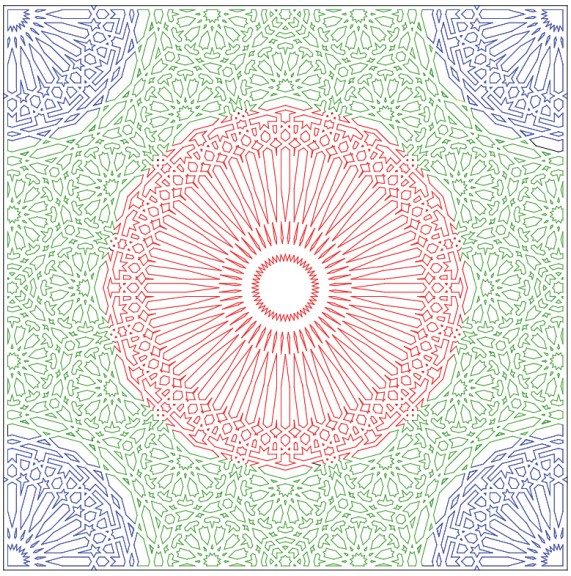
Two types of Moroccan ornamental art: are The first type is the geometric patterns called "Tastir" occur in rich profusion throughout Moroccan art. Another distinct plane pattern type perfected is the arabesque. This comprises curvilinear elements resembling leafed and floral forms called "Taouriq" and Tachjir. In this presentation we are only interesting in the plane ornamental art, particularly in the geometric drawing or "Tastir". We describe the methods of construction of the geometric patterns encountered in the Islamic art. We focus on the Moroccan method which has the particularity to respect scrupulously the rules which were adopted by the master craftsmen "Maâlam" and handed over to their disciples.
Several authors have published large collections of Islamic patterns. They focus their work on classification, analysis of theses patterns. The insights offered by all of them are interesting and valuable but they don't explain how did the Islamic patterns evolve from the simple to the complex. Our purpose is to understand the algorithm used by designers and express the empirical method into mathematical model.

It will then be possible to achieve all the known patterns on any plane area whatever by using computational program, to improve the existing pattern and to innovate others 2-dim as well as 3-dim patterns. Two methods of construction, the Foussaïfissa and Hasba, are used in the realization of Moroccan geometric patterns. The Foussaïfissa method, rather adapted to the construction of the finer mosaics leads to decorated framework space or basic pattern constituted of central area called Rosette ("Naâoura"), a peripheral area at the limit of the framework ("Alaach"), and an interface area Belt ("Lahzam"). The symmetry of the Rosette generally multiple of 8-fold is the symmetry of the motif. This method introduces a misfit between central area and periphery. To build valid motifs with perfect adequacy between the three areas, designers have to respect scrupulously several artistic rules of drawing based on the notion of module measure called Hasba.



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Keywords: symmetry; geometric pattern; measure

FA2-MS03-P04

Anatolian Turkish Architectural Ornamentation: Crystal Symmetry Applications. Didem Rodoplu[b], Semra Ide[c], Elif Hilal Soylu[d], Nermin Saman Dogan[a], Ebru Bilget[a], Heval Simsek[a]. *[a]Hacettepe University, Departmrent of Art History, 06800 Beytepe-Ankara, Turkey. [b]Hacettepe University, Institu of Pure and Applied Sciences, Nanotechnology and Nanomedicine Division, 06800 Beytepe-Ankara, Turkey. [c]Hacettepe University, Department of Physic Engineering, 06800 Beytepe-Ankara, Turkey. [d]Karadeniz Technical University, Faculty of Science & Literatur, Department of Physics 61080, Trabzon, Turkey.*
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Symmetry, from molecular size to macro size has amazingly become a part of our life [1-3]. From our historical behind, symmetry shows itself by visual work of art. At present time, this symmetry knowledge is used for technological applications. It's importance can be seen at scientific studies as mush as artistic applications. And also, symmetry knowledge carries us from the basic scientific scope to physics' (Quadratic Phase Transition Theory- Spontaneous Symmetry) and mathematics' (Diamond Theory) modern theories [4-5]. Crystal structures have excellent arrangements indicating by so many symmetry elements. In crystallography as well as structure analysis, subjects such as phase transitions, supramolecular structures' chemical design needs symmetry knowledge. Art and science can not be apart from each other. For scientific study, we transfer the whole systematic knowledge into our study but for artistic studies we express our emotions. With this study, we aimed bringing together art and science to investigate Turkish historical and cultural resources. We investigated Anatolian Seljuk and Emirates Period (in 13th -14th Centuries) religious and social architectural buildings' geometrical and vegetal ornamentations [6-7]. In addition to these samples' drawings, evaluations and original photographs are classified. As a conclusion, seeing these symmetrical applications together, can be beneficial for different disciplines such as architecture, art history, textile, crystallography, geometry, mathematical calculations, etc. Firstly, during the measurement analysis it has been found amazing, having long range huge patterns beside unit motifs. Another striking example comes across as two dimensional symmetrical applications which include curve-spherical surfaces.

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Keywords: architectural ornamentation; symmetrical application; crystallography

FA2-MS03-P05

Characterization of Clay Used for Beauty by the Moroccan Traditional Women. Fatima-Zahra Boujrhal[a,b], Rajaâ Cherkaoui El Moursli[b], Herbert Poellmann[c]. *[a]Université Sultan Moulay Slimane, Faculté des Sciences, B.P. 523, Béni Mellal, Morocco. [b]Laboratoire de Physique Nucléiare, Faculté des Sciences, B.P. 1014, Rabat, Morocco. [c]Institute for Geological Sciencesm Mineralogy/Geochemistrym Von-Seckendorff-Platz 3, 06120 Halle/Saalem Germany.*
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