

Oral Contributions

[MS40-02] **Application of Crystallographic Methods to the Study of Paintings and Archaeological Objects** Alicja Rafalska-Łasocho^a, Wiesław Łasocho^{a,b}; Marta Grzesiak-Nowak^b Agnieszka Pawlak^c, Elżbieta Nosek^d

^a*Faculty of Chemistry Jagiellonian University, ul. Ingardena 3, 30-060 Krakow, Poland;*

^b*Jerzy Haber Institute of Catalysis and Surface Chemistry PAS, ul. Niezapominajek 8, 30-239 Krakow, Poland;*

^c*Wilanow Palace Museum ul. Stanisława Kostki Potockiego 10/16, 02-958 Warsaw Poland;*

^d*Independant conservator, Krakow, Poland.
e-mail: rafalska@chemia.uj.edu.pl*

When using conventional XRPD in the investigations of the objects of cultural heritage, major phases present in the samples can be identified. Minor phases are usually detected with the use of other techniques. XRPD is a valuable technique for identification materials with similar, or even identical, elemental composition. In our studies we have analyzed samples taken from two portraits of the Polish King John III Sobieski, which belong to the collection of the Wilanow Palace Museum in Warsaw [1].

Sobieski was a great military commander whose most famous achievement was the defeat of the Ottoman Empire's army in 1683 at the Battle of Vienna. Many conservation and scientific work is presently being done under the project Monumentum Sobiescianum, whose aim is to acquire better knowledge of artists and workshops from which the King commissioned some paintings.

The aim of our studies was identification of materials used in both portraits mentioned above. We analyzed yellow, white and green pigments. It was proved that in both portraits the artists used the same pigments: lead white, chalk, lead-tin yellow type I, and others.

Moreover, powder diffraction patterns of the samples taken from similar parts of both paintings were almost identical, which suggests

that both portraits were executed by the same artist, or in the same workshop. These scientific arguments support the art historian's opinions based on stylistic criterions only. Recently we also investigated a few seals excavated in the southeast part of Poland, in the area of Cherven Towns (Grody Czerwieńskie), where in the years 2010-2011 about 2500 archaeological objects were collected. The seals we investigated were found near a village called Czermno, are dated to the 11th-13th centuries and appear to come from Rus'. Some of them were grey, but others, found in other places, were brown-red. Our task was to identify the material from which they had been made.

The XRPD measurements revealed that the seals were made of lead. The red layer on the surfaces of some of them was identified as PbO (litharge). These results were very interesting for historians and archeologists due to the fact that the use of lead seals is characteristic of Byzantine culture. In the Slav countries which developed under the influence of Latin civilization the manufacture of lead seals was very unusual [2].

All XRPD measurements were carried out using an X'PERT PRO MPD diffractometer, CuK α radiation, 40kV and 30 mA, a graphite monochromator and a PIXCEL PSD detector. The phase analysis was performed with the use of the PDF4+ database.

[1] *Primus Inter Pares*, exhibition catalogue, Warsaw, 2013.

[2] Wołoszyn M. private communication.

Keywords: powder diffractometry, phase analysis, art & archaeology