

LIBS, optical and multivariate analyses of selected 17th century oil paintings from Museum of King Jan III's Palace at Wilanów

Agnieszka Pawlak^{1*}, Wojciech Skrzeczanowski²

¹*Museum of King Jan III's Palace at Wilanów, ul. Stanisława Kostki Potockiego 10/16, 02-958 Warszawa, Poland,*

²*Military University of Technology, ul. Gen. Sylwestra Kaliskiego 2, 00-908 Warszawa, Poland*

*apawlak@muzeum-wilanow.pl

Laser-Induced Breakdown Spectroscopy results of a study of the ground layers investigated in 17th-century oil portraits belonging to the collection of the Museum of King Jan III's Palace at Wilanów, supported by microscopy and statistical analyses are presented in the paper. The unsigned artworks seem to have been painted by artists of King Jan III royal court and that is why there were chosen for examination.

The erudite king, a well-known patron of artists and broadly educated art connoisseur, was also a staunch art collector who looked for works of art in the entire Europe. Unfortunately, after his death, the valuable collection was divided among his heirs and over the years it became more and more dispersed.

After the WWII, continuous efforts have been undertaken to recreate the royal collection. In 2012 we started a new project the aim of which is to collect comparative materials in order to establish and classify differences between the technique and technology of the unsigned portraits of Jan III and his family which were presumably painted in the king's lifetime and which appertained to royal collection.

The aim of the study is to determine the technological structure of the paintings, gather comparative material that would serve to conduct further multidisciplinary attributive research.

The research is carried out with active participation of art historians, conservators and experts in conservation science. Because of the large field and numerous threads to follow, the research will be conducted stage by stage and traditional research methods as well as the most advanced ones, e.g. based on the spectroscopy, will be employed. One of the latter is laser-induced breakdown spectroscopy (LIBS).

During the investigations conducted from 2012 to 2014, we concentrated on comparison of composition of ground layers, essentially on presence of some specific elements like Li, Ba, Ti identified in grounds layers and tried to classify the paintings according the content of them. In parallel, we studied stratigraphy distributions of various elements over ground layers, which allowed us to find similarities and differences among analyzed paintings.

Five oil paintings portraits of king Jan III, queen Marie d'Arquien, and their daughter Teresa Kunegunda were tested using LIBS method and digital 3D microscopy. Results were compared with SEM/EDS and μ XRDP data available for some paintings. Obtained results allowed us to find stratigraphy distributions of elements in selected parts of paintings as well as to identify pigments used in tested points. Evident differences and similarities were found in grounds deposited on particular paintings. The analysis was additionally supported by statistical multivariate analysis. Presented results exhibit a scale of micro-destructibility introduced by LIBS.

Finally, presented results showed reasonable agreement with data obtained from other techniques and gave some indications related to workshops and authorship of the paintings.
