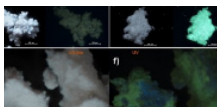

Science meets art: the case of ZnO

In the world of art conservation, a tiny particle of white paint can reveal centuries-old artistic secrets. A collaborative effort between the C2RMF and the Low Dimensional Oxides research group from INSP has shed new light on zinc white (ZnO), a pigment developed in the 19th century. In this study, ZnO nanopowders – that were obtained at the INSP under strongly controlled synthesis conditions – were used as a model system to compare with about fifty historical and modern samples. This research has uncovered unexpected complexities regarding the physicochemical properties of this white pigment and their variability within the studied samples. The findings not only provide insights into the artistic practices of the time but also offer new avenues for better identifying this pigment in major works from the 19th and 20th centuries. As conservators strive to safeguard our cultural heritage, this research provides crucial information for the proper preservation of some of the world's most valuable artworks

The study involved the analysis of 49 samples of artist materials based on zinc white, both historical and modern (e.g., pigment powders or paint tubes) from Europe and the United States. Researchers examined the composition, morphology, particle size, and luminescence of the samples. ZnO model system, a nanopowder carefully synthesized at the INSP played a crucial role in this research. With well-established physicochemical properties, this reference ZnO allowed for a more precise analysis of historical and commercial samples.

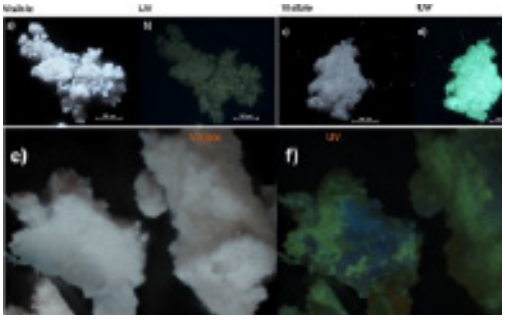

Figure
Optical microscope images (20x, under visible light at left, under UV at right) of the reference samples:
a-b) Brüggemann indirect ZnO;
c-d) Brüggemann direct ZnO;
e-f) ZnO nanopowders synthesized at INSP.

The results revealed significant differences between historical and modern samples, particularly concerning trace elements, particle size, and luminescence properties. These variations may reflect the evolution of zinc white production techniques and the pigment's aging over time, offering valuable insight into the practices of paint manufacturers and the evolution of formulations.

Additionally, the use of cathodoluminescence proved to be an effective and straightforward method for identifying pigments, reinforcing its role as a relevant complementary tool for artwork analysis.

This study on zinc white establishes a solid database for better understanding the variability of this pigment's properties and luminescent behavior, while highlighting the importance of ZnO nanopowder as a model system. The results pave the way for future research on other historical pigments and their impact on the degradation of artworks.

Reference
"An analytical survey of zinc white historical and modern artists' materials"
Nicoletta Palladino, Mathilde Occelli, Gilles Wallez, Yvan Coquinot, Quentin Lemasson, Laurent Pichon, **Slavica Stankic**, Victor Etgens and Johanna Salvant
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