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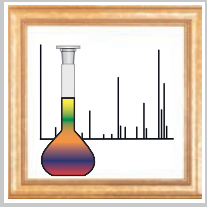

Highlights of Analytical Sciences in Switzerland

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Age and Provenance Analysis from Micrograms of Artwork Pigments

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Generally, it is possible to make a lot of money in the business of selling art, and art forgery is a direct consequence. However, no art buyer wants to be fooled, thus in the puzzle of artwork authentication the demand for scientific evaluation is continuously rising. Isotopic analysis is a very promising approach to tackle these problems by providing insights into the age and the provenance of specific materials. In this study, we focused on lead white ($2PbCO_3 \cdot Pb(OH)_2$), a widely used pigment from ancient times up till the middle of the 20th century. Accelerator mass spectrometry (AMS) allows us to measure the ^{14}C age of the pigment carbonate anion, while multi-collector inductively coupled plasma mass spectrometry (MC-ICPMS) yields highly precise lead isotope ratios for a geographical classification, as shown by Fortunato *et al.* This study had only become possible due to recent advances in AMS allowing accurate age determination from µg-levels of carbonate – hereby allowing to minimize the sample size.

Twenty paintings with signed dates covering the 17th up to the 20th century, originating either from Switzerland or Great Britain, were investigated. Sample amounts ranging from a few hundred µg's to a maximum of 1.5 mg allowed the Pb isotope ratios of the carbonates as well as the corresponding ^{14}C ages of both the carbonates and the oil binders to be determined. The results of all paintings, except one, allowed the conclusion that the used pigment was produced following a traditional production process incorporating atmospheric CO_2 and allowed to give a time range for the production of the used pigment. The lead isotope measurements showed no clear distinction between the artworks' origins but corresponded to lead ore deposits located in Europe. **In conclusion, these results illustrate the great potential of combining isotope analyses from a minute piece of lead white in the mg-range, allowing for insights into its age and provenance.**

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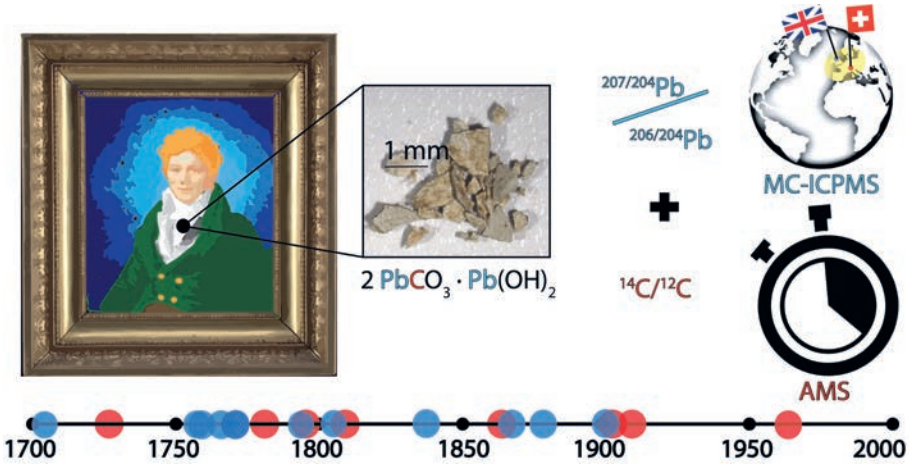

Lead white samples are taken directly from paintings and further analyzed by AMS (radiocarbon age) and by MC-ICPMS (lead isotope signature). The ^{14}C ages allow conclusions to be drawn about the production process of the pigment and give a time-range of its production. The lead isotope signatures are used for geographical classification and are in agreement with European ore sources.

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