

# Monte Carlo simulation and EDXRF analysis of the pigments used in “Natura Morta” (1946) by Mario Mafai

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The collection of Italian paintings at the Museum of Contemporary Art of the University of São Paulo (MAC-USP), Brazil, is very important since it was used to create in 1948 the first museum about Modern Art in São Paulo, Brazil [1]. Recently, five paintings are subject of research at MAC-USP, because they have another composition on their verso with non-recognized authorship. Scientific and historic investigations are being done to determine the authorship of the compositions on the verso [2,3].

One of those five paintings is the “*Natura Morta*”, oil on canvas (50.4 x 72.2 cm), produced in 1946 by Mario Mafai, which has another composition on its back of an unknown artist. To help the MAC-USP investigation to understand the pigments used by Mafai and also to compare both compositions to estimate if the back painting have been done at the same period by the same artist, we performed in situ Energy Dispersive X-ray fluorescence (EDXRF) analysis in the two paintings and interpreted the results by running Monte Carlo simulations. The EDXRF is a well-known technique for non-destructive and in situ analysis widely used in Cultural Heritage analysis [4], while Monte Carlo simulations can help to understand the multilayer structure of an object [5].

The EDXRF analysis was performed using an Amptek® Mini-X Ag X-Ray tube and an Amptek® X-123 Si-PIN detector, while Monte Carlo simulations of EDXRF spectra were performed using the XMI-MSIM code [6].

Preliminary results indicate the use of Vermilion, Cadmium Red, Zinc White, Lead White, Strontium Yellow and Iron and Chromium based green pigments. Most of the pigments found in the Mafai painting were also identified in the back composition, suggesting that both were done in the same period. Stylistic analyses, however, still need to be performed to confirm the authorship of the back composition.

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