

Are X-rays safe for manuscripts' materials?

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In the last decade, applications of X-rays to the study of manuscripts significantly spread in both diversity and extent. They range from writing material analysis, mostly with X-ray fluorescence (XRF), permitting non-invasive characterization of inks and pigments used [1], to the investigation of the origin of writing supports [2]. In addition, XRF mapping has proved to be an invaluable tool for recovering erased text [3]. Finally, computed-tomography (CT) has shown potential in virtually unrolling rolls, making text readable without using damaging mechanical methods [4]. Despite their growing use, little attention has been paid to the side effects of such analytical tools. We observed irreversible parchment colour changes during some experiments on dead-sea scrolls with synchrotron radiation sources. Furthermore, partial photo-reduction of iron under high intensity beam during X-ray absorption near edge structure spectroscopy (XANES) measurements of iron-gall ink on paper has been reported several times [5,6]. Such phenomena have mostly been overlooked so far, although there is an increasing awareness of the necessity to study them. We conducted experiments at the Deutsches Elektronen-Synchrotron (DESY) facilities to investigate X-ray induced structural alteration of paper and parchment to see whether the presence of absorption centres (ink and pigments) has an impact. In addition to better understanding degradation processes, we are aiming to define an appropriate methodology of analysis of manuscripts with a tolerable risk of damage. The first results concerning X-ray induced damage of cellulose materials have already been presented at the Synchrotron Radiation and Neutrons in Art and Archaeology (SR2A) [7]. We are focusing here on the results on parchment materials.

References

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