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Research area: General aims

Paper, paperboard and board // technical specialty papers

Key words:

Old papers, works of art, paper documents, paper analysis, spectroscopy, authentication

TITLE:**Development of New Spectroscopic Measurement Methods for Authentication of Documents and Works of Art on Paper****Background/Problem area**

Usually, paper is a cheap mass product. However, as a support for historic or important documents and works of art, paper can be of high value. Hence, paper objects are more and more subject to art forgeries and fraud. In most cases, the detection of forgeries can not only be done on the basis of scientific art expertise. Therefore, chemical analytical methods also have to be employed.

The complex composition of papers still today presents a great challenge to chemical analysis, especially when the used methods have to be non-destructive and paper components are only present in low concentrations. Raman microscopy offers new opportunities to chemical paper analysis. Raman measurements have a high chemical specificity and the use of an excitation laser and an optical microscope provides for a very high spatial resolution of up to 1 μm . In addition, Raman spectroscopy is particularly suited to paper analysis because of the weak Raman activity for OH groups. As numerous OH groups are present in cellulose these vibrations are not dominating in the Raman spectra of paper, like they do in the infrared spectra. Instead, characteristic Raman bands of other paper components can be easier identified.

Despite the great potentials of Raman microscopy for paper analysis, so far, only few Raman studies have been reported on paper which is used as a support of documents and works of art. There are many publications dealing with the analysis of color pigments and printing or writing inks on paper but not with the paper itself.

Objectives/Research results

By using the Raman imaging technique, the chemical structure, that means the presence and distribution of different paper components on the surface or along the cross-section, are detected and visualized. This includes different fibers, filler pigments, sizing compounds and others. Beside the intentionally added components to the paper, also other substances that came as trace particles with the main components in the paper or were formed during the production process can be detected and identified. The working hypothesis behind our studies is that the presence and the distribution of different paper compounds including the trace particles contain information about the potential production year and production place of the paper and its treatments. Eventually, the Raman images could be used as "finger prints" of different papers and can give objective indications of the authenticity of works of art or documents on paper.

Beside the Raman spectroscopy, the complementary techniques infrared and near infrared spectroscopy are also used. In the course of the project over 150 dated paper samples from a time period 1500 to the present will be investigated and analysed.

Application/Economic benefits

In the project the new possibilities of Raman microscopy to analyse chemical components and additives in paper will be used. This spectroscopic method makes high-resolution and high specific paper analysis possible in a way that was not feasible before. This allows new insight in the chemical composition and structure of old papers and could considerably support the combat against forgery and fraud of documents and works of art on paper.

Period of time: 01.04.2016 – 30.09.2018

Remarks

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