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Spectroscopic Investigations for Dating of Paper from the 19th Century

The knowledge of the detailed material composition of old papers can be important and useful for different purposes. It can help paper conservators to find suitable measures for paper conservation and restoration or can give paper historians information on historic paper making practices. Furthermore, the chemical analysis of paper can help to determine the age and origin of a paper and reveal forgeries of works of art or documents. Papermaking technologies have changed over time and the initial uses of certain paper components are well documented. Hence, the identification of a specific substance in a paper can determine the earliest possible date when it was produced. The more detailed the analysis of the paper composition, the more accurately the paper can be characterized and its date of production can be determined.
Spectroscopic methods like infrared (IR) and Raman spectroscopy have great potential for the specific and comprehensive chemical characterization of paper. They have a high chemical specificity and with a Raman microscope, single fibres, small particles and substances in low concentrations can be detected and identified.
The dating of paper by the identification of specific paper components is especially applicable to paper of the 19th century. During this era many changes in the paper production technology occurred and new raw materials were introduced in relatively short time intervals.
The presentation will demonstrate the application of infrared (IR) and Raman spectroscopy for the analysis of papers of the 19th century. Special emphasis will be made on the Raman microscopic identification of different fibre types, like straw, esparto, mechanical and chemical pulp, which were introduced in paper production during the second half of the 19th century.

Keywords:
paper composition, fibre analysis, infrared spectroscopy, Raman microscopy