

Highlights of Analytical Chemistry in Switzerland

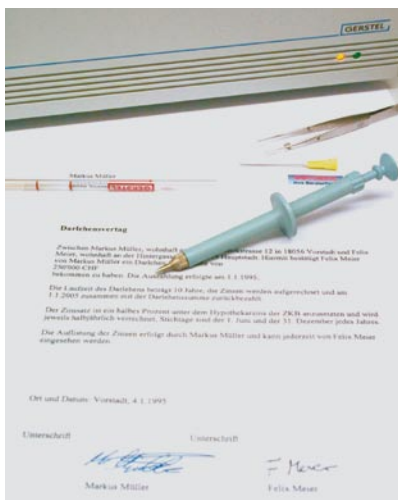
New Analytical Methods for the Forensic Document Experts

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The aim of forensic science is to find the right facts for unexplainable or unclear circumstances. For the document expert this means: he has to explain if the impression marks (handwritten or printed) on a document are genuine or falsified, *e.g.* are there any alterations since the creation of the document or is the document as a whole a forgery?



Sample cutting from a document under investigation

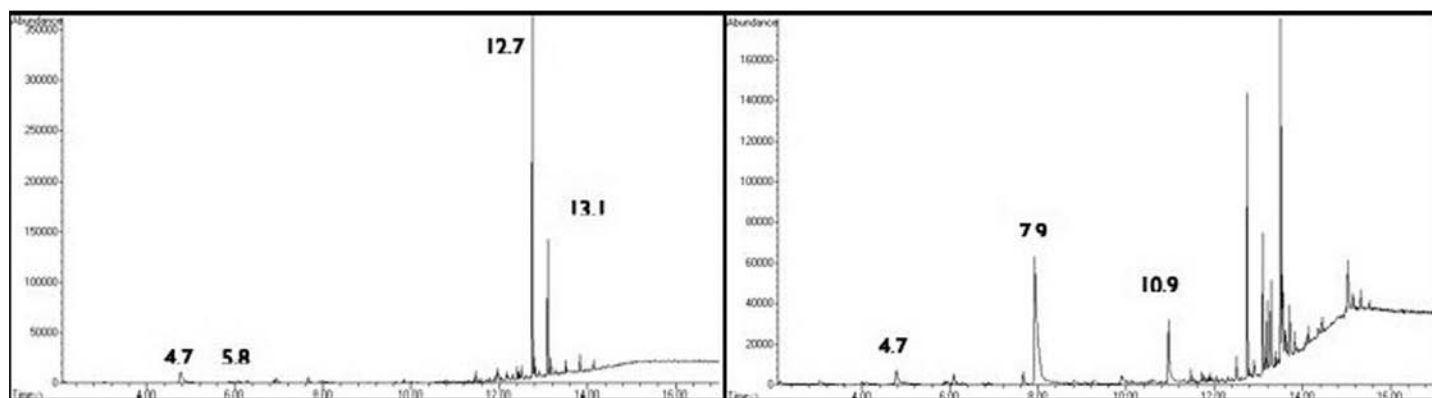
Documents are altered or forged for the advantage of a person or a group of persons, *e.g.* to increase the amount of money in a loan in the advantage of the lender. But forgery is a criminal offense and is punishable by law.

In forensic science the presence of documents can also shed new light on unsolved cases. Therefore, it is important to find scientific methods to clarify whether forgery took place and to find answers about the timeframe in which alteration could have taken place.

A well-suited analytical technique is GC/MS because of its great sensitivity. However, to obtain information about printing or writing systems on a molecular basis it is necessary to transfer the relevant molecules to the gas phase. Aggravating circumstances are on the one hand that the paper matrix retains the molecules of interest, and on the other hand that chemical substances from the paper itself evaporate that interfere with the important compounds of the writing devices. Therefore attempts to use pyrolysis GC on document samples led to numerous peaks, coming from the writing device under investigation and from the paper; in addition, cross products at high pyrolysis temperature between writing device and paper make the interpretation of the results even more difficult. What is needed is a GC injection method where the temperature can be lowered and the evaporated gases of the sample can be measured at different temperature steps. Thermal desorption at controlled temperature for a certain period of time (several minutes) and a continuous gas flow over the paper with the writing ink are necessary. The compounds of interest will continuously desorb in low amounts. To obtain a measurable signal, the desorption products are first collected before they enter the GC; this is best done by cryofocusing with liquid nitrogen.

In our laboratory we are using a thermodesorption system combined with a cryofocus from Gerstel connected to a GC/MS from Agilent. With this system we can detect and differentiate writing devices of the same type (*e.g.* two ballpoint pens from different producers) or detect the age of the paste of ballpoint pens. For such an analysis document cuttings as small as 5 mm are sufficient to elucidate complicated and unclear cases.

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GC/MS results using a thermodesorption/cryofocus unit from two 5 mm ballpoint pen strings from different producers on normal office paper

Can you show us your analytical highlight?

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