A33 Casework ICPMS/IRMS Examples in the Netherlands

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After attending this presentation, attendees will understand the advantages of the transparant and interactive nature of reporting of forensic ICPMS and IRMS results to both police as well as court authorities in the Netherlands.

The presentation will impact the forensic science community by providing insight into the use of forensic (LA-)ICPMS/IRMS results

throughout the complete judicial process, including the police investigation phase and the court phase.

In this presentation, a number of forensic IRMS/(LA-)ICPMS applications are discussed demonstrating the strong discriminating power of this technique combination. These techniques are used for a wide variety of forensic material casework investigations (various tape types, glass, XTC, drug precursors, paper, sawdust, ink, bullets, brass, and other metals, rope materials, cables, polymeric jerrycan remains in arson residues, human materials for tracing geographic origin unidentified human victims). For a selected number of general casework investigations experiences are shared below and general trends and aspects discussed.

LA-ICPMS and IRMS casework investigations mostly center on material comparisons, e.g., does this piece of material as found at the crime scene and a similar material as found with the suspect originate from one source? As one hypothesis the materials are therefore considered to originate from one source (e.g., roll of tape). Most of the investigated materials are industrially produced in production batches. As alternative hypotheses we will typically consider that materials are from the same production batch; from another production batch but the same producer or from other random producers.

Weighing of the evidence is based on scientific literature results and Netherlands Forensic Institute (NFI) investigations on limited numbers of samples to test literature information applicability for the Dutch situation. An interactive process is used in reporting. Mostly (fast, softer) forensic intelligence is generated for the police investigation phase.

For the court evidence phase in first instance we will report the findings as of that moment and mention possible follow-up studies. Dependant on the court response some aspects of the first investigation may be further substantiated in a follow-up study.

In one example a series of police cars were torched near police stations throughout the Netherlands. The modus operandi (MO) often consisted of placing a jerrycan filled with petrol on top of a police car and torching it. At two crime scenes (A+B) almost completely burnt jerrycan remnants were recovered and offered for a comparison to see if there was a link. Burnt jerrycan remnant samples were cut to gain access to visually appearently unchanged core material. Visual, FTIR and µ-XRF investigations could not discriminate materials from both crime scenes A and B. Both jerry can remnants contained poly ethylene.

Samples were therefore investigated with IRMS and LA-ICPMS and from the results could be discriminated.

In a second example explosives and other materials were found in various Dutch cities and believed to be in preparation for a terrorist attack. Forensic investigations were made on possible links between materials from different sites. Compared were a device consisting of two packages of pentrite (PETN) explosives next to a metal frame with two magnets and grey duct tape (figure 3) with a roll of grey duct tape from another location. The focus of the comparisons with visual, FT-IR, LA- ICPMS and IRMS was on these tapes and results were also combined with results from physical fit investigations. Interesting was also the unexplained presence of small orange foil particles in the glue layer of both these tape materials.

In a third example two murdered males were found walled in an empty building. In one forensic investigation red polypropylene ropes as bound around a crime scene carpet and as found at a location controlled by a suspect is compared using IRMS. The crime scene rope samples were heavily contaminated with human decomposition products and were cleaned ultrasonically before analysis. FTIR was applied but results were insufficient for discrimination. IRMS results for the three rope samples vary more than expected from repeatability experiments but still offer potential for discrimination. One of the reference ropes was easily discriminated but another rope was closer to the crime scene samples. Interestingly the heavy contamination does not appear to influence variability for the crime scene samples.

In this presentation the high discrimination power of the IRMS/LA- ICPMS technique combination is demonstrated. If samples are also not

discriminated using IRMS and LA-ICPMS, for the police investigation phase this is normally already important information in view of the high discrimination power of this combination. Some examples are presented

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where samples were potentially too contaminated (rope) or transformed (jerrycan) to be used for forensic purposes. Still useful information could be extracted for these samples.

IRMS, ICPMS, Rope

