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## Multicomponent characterization and differentiation of flash bangers - Part II: Elemental profiling of plastic caps

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### Highlights

- Expansion of the multicomponent analysis strategy for flash bangers.
- LA-ICP-MS, XRF and IRMS analysis of blue and white plastic caps from flash bangers.
- Additional differentiation is possible on visually indistinguishable caps.
- Elemental profiling of caps provides a unique opportunity for post-explosion cases.

### Abstract

This study builds on the multicomponent analysis strategy for flash bangers which was previously introduced and where a representative sample set has been collected of a certain type of flash bangers. To expand the forensic strategy, elemental analysis of the plastic caps which are present in these items was performed. Both x-ray fluorescence (XRF) and laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) analysis was performed to explore the possibilities for differentiation. The inherent inhomogeneity of the plastics resulted in high variations, especially for LA-ICP-MS trace analysis. In addition, due to the lack of suitable reference materials the LA-ICP-MS results can only be used for qualitative comparisons. Although XRF is less sensitive it allows for semi-quantitative analysis and the effect of inhomogeneity is significantly reduced due to the larger sample areas. Therefore, XRF is the method of choice for elemental analysis of intact plastic caps. In this scenario initial differentiation based on visual examination is combined with elemental analysis to obtain the highest degree of discrimination. In post-explosive scenarios, using XRF is not as

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