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Broadening the dynamic range of PGAA using a high-efficiency detector array

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We studied how we can improve the analytical sensitivity of prompt gamma activation analysis using the most advanced gamma-spectrometry system, FIPPS/IFIN at ILL. The high counting efficiency and the coincidence possibility with altogether 64 HPGe detectors offer a unique opportunity to unfold the spectra where a strong matrix masks the weak signal from trace components, like Cl a highly important corrosive in Fe or silicate matrices. The detection limits and the dynamic range for such measurements were determined at FRM II, Garching in high-flux cold neutron beam with a single Compton-suppressed HPGe detector and were found to be about 80 ppm for the iron matrix. Small-mass model samples were used at ILL with known amount of trace Cl on the 1-100 ppm level using Fe plates together with PVC films. Using the FIPP/IFIN detector system, we could achieve an improvement of an order of magnitude in the detection limit.

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