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Potential of INAA in elemental analysis of heroin, cocaine, and methamphetamine

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The analysis of illicit drugs composition is required for effective actions of Law Enforcement Agencies. Determination of major as well as trace elements provides additional parameters that could help in identification of drugs origin. Heroin, cocaine and methamphetamine samples were assayed by instrumental neutron activation analysis (INAA) for determination of mass fractions of several elements. For completeness, a set of adulterants used for drugs cutting was also included in the study. The results suggested that INAA with short time irradiation was especially attractive due to its simplicity and short turnaround time. Some adulterants are specific in significantly different content of chlorine in comparison to heroin, cocaine, and methamphetamine (all three as hydrochlorides). Therefore, chlorine analysis has the potential to estimate adulterant used and its quantity. Iodine was quantified in all methamphetamine samples, and mass fractions span four orders of magnitude. This could indicate specific compounds and procedures used in production. Despite INAA unsatisfactory detection limit of sulfur for most materials, its mass fraction was determined in several drug samples. High sulfur content most probably indicated that methylsulfonylmethane and levamisole were used as cutting agents.

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