Overview of Scientific Research at the PA CR Focusing on Security and Some Specific Results Achieved Using the INAA Method for the Detection and Identification of Seized Illicit Narcotic Drugs and Psychotropic Substances

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Abstract. The paper provides an overview of the main activities of the Police Academy of the Czech Republic in Prague (PA CR), with a particular emphasis on safety and security research over the past few years. Some specific projects at the PA CR are listed, including those implemented in cooperation with other partners within the Ministry of the Interior of the CR or other ministries and institutions. The results achieved within the project, which focused on applying the instrumental neutron activation analysis (INAA) method for detecting and identifying contraband drugs and other narcotics, are presented in more detail. Based on the assessment of their elemental composition, the results of the INAA analysis make it possible to obtain the information needed to reliably determine the location and origins of these illegally transported substances that were intercepted by the relevant security authorities. The developed methodology can also be used to disclose and detain persons suspected of producing and distributing drugs and other addictive illegal substances. The method is also helpful for analysing glass samples from cars involved in unreported accidents.

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Introduction

The PA CR, with its headquarters in Prague, is a university-type state higher education institution within the Ministry of the Interior of the Czech Republic (MI CR), which was founded in 1993. PA CR offers full-time or combined Bachelor’s (BS), Master’s (MSc.) and Doctoral (Ph.D.) study programs. Studies in each of these programmes are completed by passing comprehensive state exams in selected subjects and a bachelor’s, diploma or dissertation thesis defence. The PA CR
consists of the Faculty of Security Management (FSM) and the Faculty of Security and Law (FSL).¹

Graduates of the PA CR can find employment in relevant managerial positions and some specialised professions in the various departments of the MI CR, the Police of the CR, municipal police, the Military Police, the Customs Administration, the Security Information Service, the Prison Service, and also in private security services.

The Police Academy is one of the most prestigious universities in the CR. This is why there is enormous interest in studying at the PA CR, both among high school students and employees of the MI CR and other ministries engaged in safety and security areas. In addition, the sizeable attendance of those interested in studying at the PA CR in its regularly organised Open Doors Days shows that the university has a good reputation among students and attracts their attention.

The PA CR includes two faculties, namely the Faculty of Security and Law (FSL) and the Faculty of Security Management (FSM). The FSL focuses on the bachelor’s level in Studies of security and law, Police activity, Criminal science and other forensic disciplines, while through its master’s level, the faculty is oriented towards Police management and criminal science. On the other hand, FSM is engaged in Security Management in Public Administration (BS. Level and MSc. Level). The curriculum is organised through both full-time and distance learning. In addition to BS. and MSc. studies, there are also Ph.D. courses addressing specific topics related to safety and security. Furthermore, the PA CR participates in the EU Erasmus Programme, where it hosts 20–30 students each term from the EU Member States and some other European countries every year. At the same time, up to 10 PA CR students spend one term at the counterpart universities.

Fig. 1. Emblem of the Police Academy and a view of the Campus in Prague

The PA CR in Prague

Official emblem

PA premises


Overview of some recent scientific projects at the PA CR

The PA CR has been participating in many projects, most of which have been carried out within the programmes of various ministries of the CR and other sponsors. Most of them were supported by multiple research programmes in cooperation with partners from other countries, mainly Member States of the EU. Later in this paper, selected research projects carried out from 2017–2022 are summarised. Some of these research projects were also supported within the EU Programme Horizon.

Summary of primary research activities at the PA CR in the years 2017–2022

The PA CR, as a university-type research organisation, focuses predominantly on safety and security research reflecting the needs of the Czech Republic in achieving and maintaining sustainable development in all relevant areas.2

The strategic goal of the PA CR is to maintain its position as a centre of research in safety, law and security management in close connection with the public administration, the department of the MI CR, the PA CR, the Fire and Rescue Service of the CR and other pertinent institutions and organisations of the state.

The scientific activities of the PA CR are guided mainly by its approved Development Programme for the years 2017–2023 and then by the newly emerging requirements of security research.

In this period, safety and risk management are the dominant aspects of the research activity at the PA CR. The strategy for the further development of PA CR is therefore aimed at the following basic directions of research activity:

• Criminology and forensic disciplines, the goal of which will be the identification of the fundamental problems of forensic science, their theoretical analysis and transformation into a proposal for the optimisation of algorithms for the identification of objects and systems.

• Security management and crisis management, the aim of which will be to create and propose alternative solutions for partial scenarios of basic situations in the area of population protection and critical infrastructure protection as well as internal security and public order, both using relatively affordable means that may be available to the public administration, and based on sophisticated systems.

• Analysis and prediction of selected police security issues with a particular emphasis on current security threats of an anthropogenic nature, with the possibilities of their elimination as essential priorities.

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• Analysis and prediction of selected current problems of public administration, within which the research tasks will be focused, for example, on the issue of shaping the anti-extremist policy of the CR and on the analysis of current trends in the field of information crime, with a proposal of recommendations for their forensic analysis.

Research activities of the PA CR are coordinated and implemented mainly along the lines of both faculties and are focused on:
• The development of the theoretical scientific basis of security sciences.
• The analysis and prediction of selected current forms of crime and socially pathological phenomena.
• The needs and forms of strengthening the competencies and cooperation of security entities.
• The streamlining of the functioning of population protection and the crisis management system within the Czech Republic.
• Cyber security and protection of critical information infrastructure.

Some research projects conducted in 2022

The PA CR actively and systematically approaches the fulfilment of its social obligations as a research organisation. The implemented projects are consistent with the Development Program of the PA CR for the years 2021–2026.

The strategic goal is to deepen knowledge about social phenomena affecting the internal security of the state and, thereby, strengthen the originality and relevance of scientific and research activities of the PA CR, i.e., to justify research efforts by organising relevant research or participating in it. Closely related to this is the goal of strengthening the social usefulness and the scientific contribution of research activities: increasing the practical the security sphere, as well as the publication and dissemination of results in a national and European context, through quality publications in the Web of Science or Scopus databases.

In 2022, the scientific activities of the PA CR focused on fulfilling ongoing and newly defined security research priorities, both of national and European importance. Academic workers focused their creative attention on developing the theoretical foundations of security sciences. At the same time, they responded promptly to the requirements and challenges of Czech and European security practices. Using a synergistic approach, they sought to actively match modern security science with current security technologies and requirements. One can mention, for example, the open cooperation of the PA CR with the European network ENLETS (European Network of Law Enforcement Services), which resulted in the preparation of the joint international project ARICA 2, oriented towards helping abused children victims and child trafficking.

In 2022, two new projects were launched:
• ARICA 2: Prevention of child sexual abuse, assistance to victims of child sexual abuse and tools to detect child sexual abuse online. The project is supported by the European internal security fund.
• Project VC20222025001: Methods of processing a detailed property profile used to impose a protective measure ‘withholding part of the property’ according to the Criminal Code.
Other targeted support projects carried out in 2022, in which the PA CR was a partner and co-investigator:

• Elemental characterisation of microtraces and narcotic and psychotropic substances by nuclear analytical methods, VI20192022162 (under the MI CR). This project will be further discussed in some detail.
• Use of radiation methods to detect and identify CBRNE materials, VI20192022171 (under the MI CR).

Scientific research activities at the individual faculties of the PA CR are also conducted through their participation in institutional support projects.

The research activity of the faculties of the PA CR in 2022 was oriented towards institutional support in four directions:

• Development of the theoretical scientific base of security sciences (substantive and procedural criminal law, forensic techniques, tactics and methodology, criminology and forensic disciplines).
• Analysis and prediction of serious forms of crime and current socio-pathological phenomena.
• Analysis and prediction of the needs and forms of strengthening the competencies and cooperation of security entities for the effective and competent functioning of public administration.
• Streamlining the functioning of the population protection and crisis management system within the Czech Republic.

The research program of the Faculty of Security Management, ‘Scenarios and predictions of strategic changes in the security environment of the Czech Republic’, was completed in the seventh year of implementation but only in the research direction ‘Efficiency of the functioning of the population protection and crisis management system’. The activity ‘Cyber security and protection of critical information infrastructure’ was finished in 2020.

The research program of the FSL, ‘Current security threats of an anthropogenic nature and the possibilities of their elimination’, was completed during the seven years of implementation in all three research directions, and eleven research tasks were partially completed.

Scientific research and lecture stays of the PA CR academic staff abroad can also be considered significant, for example, a stay in Tunis — Dynamic Security in Prisons (UNODC — United Nations Organization Drugs and Crime event — radicalisation of imprisoned persons and the area of dynamic security); a stay in Ljubljana, Slovenia (introductory negotiations on the HOPE Project — Holistic Radicalisation Prevention Initiative — action focused on the issue of radicalisation in the Balkans, in the prisons there, cooperation between security forces in the field of radicalisation); a stay in Poznań, Poland (introductory negotiations on the MIRAD Project — Multi-Ideological Radicalisation Assessment towards Disengagement); a stay at Ludovika University — University of Public Service, Budapest, Hungary, and some others. The scientific internship of dr. Aneta Sokół from the University of Szczecin, Poland, took place in last three months of 2022.

In addition, in 2022, the Rector of the PA CR, Col. David Dlouhy, Ph.D. and Vice President of the Texas Tarleton State University, Diane Stearns, Ph.D., signed a Memorandum of Understanding (MOU) which enables academic staff and students of the PA CR to develop specific contacts and cooperation with our US partners.
This document paves the way for more intensive cooperation and working contacts between Czech and US colleagues in the field of security, including writing and publishing joint scientific papers in the USA and the Czech Republic. Exchange study visits of lecturers and students in the field of mutual interest are also foreseen.

The Police Academy has established working contacts and cooperation with some institutes of the Academy of Sciences of the Czech Republic (AS CR), for example, with the Institute of Sociology, the Institute of State and Law and the Institute of Contemporary History. These interconnected activities are going to be intensified in the future following the signing of the memorandum of cooperation signed by the Rector of the PA CR, Col. D. Dlouhý, Ph.D., and Dr. E. Zažímalová, Ph.D., the President of the Academy of Sciences of the Czech Republic (AS CR) (Fig. 2).

Fig. 2. Rector of the PA CR and the President of the AS CR after signing the memorandum

![Image of Rector and President signing memorandum](https://www.polac.cz/g2/index.php)

Source: https://www.polac.cz/g2/index.php

**Results achieved under the project aimed at drug detection**

Elemental characterisation of narcotic drugs and psychotropic substances as well as specific microtraces by nuclear analytical methods was carried out under the research project V120192022162 under the framework of the cooperation between the PA CR and the Nuclear Research Institute of the Czech Academy of Sciences in Rez near Prague. The Instrumental Neutron Activation Analysis [NAA] was used to determine the samples’ elemental compositions by converting stable (non-radioactive) atoms into radioactive isotopes with unstable nuclear configurations. These newly formed radionuclides decay and emit gamma rays with energies characteristic of the particular element. The number of emissions is related to the element concentration in the sample.

Generally, the INAA technique uses nuclear reactions in an analysed sample caused by the intensive flux of neutrons from reactors or other suitable strong neutron sources. After irradiation, the sample becomes radioactive and emits radiation
which is then analysed spectrometrically. The energy of gamma photons makes it possible to identify the composition of the sample, and the photon intensity is proportional to the element content in the sample. The INAA is the most sensitive analytical technique used for the quantitative multielement analysis of major, minor, and trace elements in samples from almost every conceivable field of scientific or technical areas and fields. It is also widely used to detect and identify drugs and other narcotics. Based on the unique presence of trace elements, it would be possible to establish the origin of the seized drugs since some specific composition of these elements characterises each region.

The principle of the INAA is illustrated in Fig. 3, where individual interactions and the main steps of the analyses are shown.

Fig. 3. Schematic representation of neutron activation analysis steps and illustration of the neutron capture process

Source: Based on https://indico.fjfi.cvut.cz/event/195/contributions/3607/

Figure 4 shows the principal conventional parts of the INAA instrumentation, including the detector cooled by liquid nitrogen accommodated in the Dewar container and electronic blocks starting from the power supply, the preamplifier, linear amplifier, analogue to digital converter and computerised multichannel analyser. In the current instrumentation for INAA, most of these blocks, including a dedicated computer, are integrated into one compact piece of equipment. As a detector for the spectrometry of gamma radiation, the germanium detector is usually positioned in a sufficient lead shield to reduce its background radiation response.

Fig. 4. Schematic representation of neutron activation analysis steps


Some results of the measurement of heroin and cocaine samples are presented in Table 1 and Table 2.

**Tab. 1. Contents of elements in heroin and cocaine samples determined by the INAA method**

<table>
<thead>
<tr>
<th>Nuclide, unit</th>
<th>Sample code</th>
<th>Ratio $c_{max}/c_{min}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H963</td>
<td>H1056</td>
</tr>
<tr>
<td>Na, mg.kg$^{-1}$</td>
<td>2080±30</td>
<td>294±4</td>
</tr>
<tr>
<td>Al, mg.kg$^{-1}$</td>
<td>11±3</td>
<td>52±2</td>
</tr>
<tr>
<td>Cl, mg.kg$^{-1}$</td>
<td>686±21</td>
<td>44±14</td>
</tr>
<tr>
<td>Ca, mg.kg$^{-1}$</td>
<td>640±50</td>
<td>2260±100</td>
</tr>
<tr>
<td>Mn, mg.kg$^{-1}$</td>
<td>0.29±0.03</td>
<td>4.15±0.19</td>
</tr>
<tr>
<td>Fe, mg.kg$^{-1}$</td>
<td>5.5±1.4</td>
<td>80±3</td>
</tr>
<tr>
<td>Zn, mg.kg$^{-1}$</td>
<td>2.91±0.10</td>
<td>2.85±0.09</td>
</tr>
<tr>
<td>Br, mg.kg$^{-1}$</td>
<td>0.98±0.15</td>
<td>0.11±003</td>
</tr>
<tr>
<td>Sr, mg.kg$^{-1}$</td>
<td>&lt; 4</td>
<td>10.0±0.8</td>
</tr>
<tr>
<td>I, mg.kg$^{-1}$</td>
<td>15.8±1.1</td>
<td>&lt; 1.5</td>
</tr>
<tr>
<td>Sm, μg.kg$^{-1}$</td>
<td>&lt; 7</td>
<td>5.6±1.3</td>
</tr>
<tr>
<td>Th, μg.kg$^{-1}$</td>
<td>&lt; 7</td>
<td>9±3</td>
</tr>
<tr>
<td>Co, μg.kg$^{-1}$</td>
<td>&lt; 9</td>
<td>12±3</td>
</tr>
<tr>
<td>Sc, μg.kg$^{-1}$</td>
<td>1.2±0.2</td>
<td>11.4±0.3</td>
</tr>
</tbody>
</table>

Tab. 2. Contents of elements in heroin and cocaine samples determined by the INAA method

<table>
<thead>
<tr>
<th>Nuclide, unit</th>
<th>Sample code</th>
<th>Ratio $c_{\text{max}}/c_{\text{min}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>K1300</td>
<td>K1301</td>
</tr>
<tr>
<td>Na, mg.kg$^{-1}$</td>
<td>189±3</td>
<td>8.64±0.14</td>
</tr>
<tr>
<td>Cl, mg.kg$^{-1}$</td>
<td>10.39±</td>
<td>8.95±0.15</td>
</tr>
<tr>
<td>Mn, mg.kg$^{-1}$</td>
<td>5.6±0.4</td>
<td>1.5±0.3</td>
</tr>
<tr>
<td>Zn, mg.kg$^{-1}$</td>
<td>9.6±0.2</td>
<td>19.3±0.4</td>
</tr>
<tr>
<td>Co, μg.kg$^{-1}$</td>
<td>&lt; 9</td>
<td>11±3</td>
</tr>
<tr>
<td>Sc, μg.kg$^{-1}$</td>
<td>2.1±0.2</td>
<td>1.3±0.2</td>
</tr>
<tr>
<td>Br, mg.kg$^{-1}$</td>
<td>8.53±0.15</td>
<td>5.20±0.09</td>
</tr>
</tbody>
</table>

Source: Based on: J. Kučera, J. Sabol et al., p. 105.

The project was focused on introducing nuclear analytical methods, neutron activation analysis and X-ray fluorescence analysis to determine elements in microtrace samples, especially narcotic drugs and psychotropic substances. The elemental composition analysed by appropriate methods can be used for forensic purposes in determining the origin of microtraces by comparison with specific standards. Particular impurities in substances will indicate the origin of the drug or production method used in the illegal laboratory.

The project followed a recently conducted pilot study in which samples of heroin and cocaine seized in the Czech Republic were analysed. The developed certified methodologies contributed to more effective clarification of criminal activity and the design of other methodologies for the detection and identification of samples per the requirements of forensic and security practice. It is assumed that the developed procedures will be adapted to meet the needs of the relevant components of the Ministry of Interior of the CR (MI CR), especially the Police of the Czech Republic.

Illegal import and trafficking of drugs and psychotropic substances and their use is a serious problem worldwide, including in the CR. Therefore, there are efforts to identify the geographical origin of drugs, methods of their production and dilution based on the results of chemical analyses. The data obtained can contribute to detecting smuggling, production and distribution networks. Most of the papers published so far have dealt with determining the content of active substances and organic impurities in drugs.

Due to the need to determine very low concentration of elements, the method of mass spectrometry with inductively coupled plasma (ICP-MS) is most often used. For the purposes of the project, the INAA method was used, which was utilised in a previously carried out feasibility study and was applied in the project to a larger number of samples of different types.

Various physical methods are successfully used for the non-destructive detection of drugs and other narcotics. In some applications, instrumental neutron activation analysis (INAA) has proven particularly suitable due to its high sensitivity and reliability$^4$ [7-9].

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Neutron Activation Analysis (NAA) is a sensitive and accurate trace element analytical method. Samples are irradiated in a nuclear research reactor to analyse the characteristic gamma rays that were emitted during radioactive decay. These distinct energy signatures provide positive identification and quantification of the targeted elements present, while their intensity is proportional to the concentration of the element in the sample. Samples are measured without any preparation, thereby avoiding problems that are common with other techniques: incomplete dissolution, loss of volatile elements, and contamination from laboratory chemicals. Neutron activation is not subject to calibration uncertainties associated with chemical methods of trace elemental analysis, further enhancing the accuracy.

The feasibility study carried out in the initial phase of the project confirmed the advantages and potential of the INAA method for the study of drug contamination with mineral elements and the readiness of our workplaces to solve this demanding analytical task.

A methodology and relevant requirements were developed, including sample preparation and irradiation procedures in an experimental nuclear reactor, specific measuring equipment and a team of qualified experts. Therefore, it was decided to continue with the analyses of a larger number of samples with the ultimate goal of creating a database of the elemental composition of drug samples confiscated or captured on the territory of the CR.

The existence of such a database will be of significant benefit for the relevant police authorities and anti-drug institutions to increase the effectiveness of measures against the illegal importation and spread of drugs in the CR. In addition, the INAA method was also effectively used to identify vehicle glass\(^5\) \cite{Kamenik2022}. It is known that many vehicular accidents and crimes are often associated with the production of glass fragments. Shards found at the crime scene and micro-fragments attached to the suspect’s clothing are traces available for law enforcement agencies. The refractive index is often used as a parameter for glass profiling. As an additional characterisation, the chemical composition of glass fragments was studied by both INAA and X-ray fluorescence analysis. Although the distribution of the determined values for some elements was relatively uniform, several elements proved to be promising for forensic applications due to significant differences in their mass fractions in the analysed samples (e.g., K, Mn, Se, Rb, Zr, Ce).

Since the work takes place near strong neutron sources, which also emit gamma radiation, it is necessary to ensure adequate protection of personnel and other persons who could be exposed to unwanted radiation, especially in the event of an emergency situation\(^6\) \cite{Sabol2022}. It is, therefore, essential to follow the strict relevant requirements set by the national regulatory authorities and to keep in line with the latest international standards in the field, including the correct use of introduced quantities and units to assess the radiation risk (Fig. 5). At present, it seems that too…


\(^6\) J. Sabol, Ensuring adequate…, op. cit.
many radiation protection quantities are in use, which may sometimes complicate the introduction of optimal protection measures and the interpretation of measurement results at workplaces and in the environment. Understanding and correctly using radiation protection quantities are also essential in communicating to the public the radiation hazards related to the peaceful use of radiation and nuclear technologies.

**Fig. 5. Relationship between quantities used in radiation protection**

![Diagram showing the relationship between quantities in radiation protection]


**Conclusion**

The paper briefly summarises some research activities carried out at the PA CR in the last few years with more details on projects in 2022. In addition, one of those projects completed in 2022, based on the INAA method, is more thoroughly discussed, and the main results are presented. This overview of the scientific engagement of the PA CR shows that this university is not only very successful in its teaching accomplishments but also demonstrates how the university can effectively combine the educational process with scientific activities.

The paper clearly shows many advantages of applying INAA for the detection and identification of narcotic drugs, psychotropic substances and the analysis of car glass for forensic purposes where identification of vehicles is important. It has been stressed that in any application of radiation and nuclear technologies, ensuring adequate protection of workers and the public is of primary concern.
In general, the use of INAA techniques has proven to be a very efficient and reliable approach to obtaining information, which can be successfully used in investigating specific criminal offences. It is worth mentioning at least some of the advantages of neutron activation analysis\(^7\) [11]: a) results independent of the chemical form of an analysed sample, b) free of contamination from laboratory chemicals, c) very simple sample preparation, d) practically no matrix effects, e) suitable for most matrices, f) cost-effective analysis of more than 30 elements (NAA is not suitable for the analysis of lead, bismuth, or phosphorus), g) extremely high sensitivity for specific samples (a few parts-per-billion), and h) only milligrams of sample material are required. The main disadvantage of applying the INAA technique is the availability of sufficient neutron sources, where a nuclear reactor is still the best solution, but they are accessible only to some analytical laboratories. Typically, in a medium-size country like the CR, only one or two nuclear research reactors which can be used for the INAA are available.

References


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Streszczenie. W artykule przedstawiono przegląd głównych aktywności Akademii Policji Republiki Czeskiej w Pradze (PA CR), ze szczególnym uwzględnieniem badań nad bezpieczeństwem i ochroną na przestrzeni ostatnich kilku lat. Przytoczono niektóre konkretne projekty w PA CR, w tym realizowane we współpracy z innymi partnerami w resorcie spraw wewnętrznych CR lub przez inne ministerstwa i instytucje. Bardziej szczegółowo przedstawiono wyniki osiągnięte w ramach projektu, który dotyczył zastosowania metody instrumentalnej neutronowej analizy aktywacyjnej (INAA) do wykrywania i identyfikacji przemyconych narkotyków oraz innych środków odurzających. Na podstawie oceny ich składu pierwiastkowego, wyniki analizy INAA umożliwiają uzyskanie informacji potrzebnych do wiarygodnego określenia lokalizacji i pochodzenia nielegalnie przewożonych substancji, które zostały przechwycone przez odpowiednie organy bezpieczeństwa. Opracowana metodologia może być również wykorzystywana do ujawniania i zatrzymywania osób podejrzanych o produkcję i dystrybucję narkotyków oraz innych nielegalnych substancji uzależniających. Metoda ta jest również pomocna przy analizie próbek szkła z samochodów uczestniczących w niezgłoszonych wypadkach.

Resumen. El presente artículo ofrece una visión general de las principales actividades de la Academia de Policía de la República Checa en Praga (PAČR), con una especial atención a la investigación en materia de seguridad y protección a lo largo de los últimos años. Se detallan algunos proyectos específicos llevados a cabo en la PAČR, incluidos los realizados en cooperación con otros socios del Ministerio del Interior de la República Checa o de otros ministerios e instituciones. Más detalladamente se presentan los resultados obtenidos por el proyecto centrado en la aplicación del método instrumental de análisis por activación neutrónica (INAA) para la detección e identificación de drogas y otros estupefacientes de contrabando. Basándose en una evaluación de su composición elemental, los resultados del análisis INAA proporcionan la información necesaria para determinar de forma fiable la localización y el origen de estas sustancias transportadas ilegalmente que han sido interceptadas por las autoridades de seguridad pertinentes. La metodología desarrollada también puede utilizarse para descubrir y detener a individuos sospechosos de producir y distribuir drogas y otras sustancias adictivas ilegales. El método sirve asimismo para analizar muestras de vidrio de automóviles involucrados en accidentes no declarados.

Zusammenfassung. Dieser Artikel gibt einen Überblick über die wichtigsten Aktivitäten der Polizeiakademie der Tschechischen Republik in Prag (PA CR), wobei der Schwerpunkt auf der Sicherheits- und Schutzforschung der letzten Jahre liegt. Es werden einige spezifische Projekte der PA CR angeführt, darunter solche, die in Zusammenarbeit mit anderen Partnern im Innenministerium der Tschechischen Republik oder von anderen Ministerien und Institutionen durchgeführt wurden. Ausführlicher wurden die Ergebnisse des Projekts vorgestellt, das die Anwendung der instrumentellen Neutronenaktivierungsanalyse (INAA) zum Aufspüren und zur Identifizierung von geschmuggelten Drogen und anderen Betäubungsmitteln zum Gegenstand hatte. Die Ergebnisse der INAA-Analyse liefern auf der Grundlage einer Bewertung ihrer elementaren Zusammensetzung die Informationen, die erforderlich

Резюме. В статье представлен обзор основных направлений деятельности Полицейской академии Чешской Республики в Праге (ПА ЧР) с особым учетом исследований в области безопасности и охраны, проводимых на протяжении последних нескольких лет. Приводятся некоторые конкретные проекты ПА ЧР, включая те, которые проводились совместно с партнерами МВД ЧР или другими министерствами и ведомствами. Более подробно представлены результаты, полученные в рамках проекта, связанного с применением метода инструментального нейтронно-активационного анализа (ИНАА) для обнаружения и определения контрабандных наркотиков и других наркотических веществ. Результаты ИНАА-анализа, основанные на оценке их элементного состава, позволяют получить информацию, необходимую для достоверного определения локализации и происхождения незаконно перевозимых веществ, которые были изъяты соответствующими органами безопасности. Разработанная методика может быть использована также для выявления и задержания лиц, подозреваемых в производстве и распространении наркотиков и других незаконных психотропных веществ. Метод полезен также при анализе образцов стекол автомобилей, участвовавших в ДТП, о которых не было заявлено.