**Popularnonaukowe streszczenie projektu (max. 1 strona maszynopisu w języku angielskim)**

The objective of the project, is to perform high resolution spectroscopy near the absorption edge (NEXAFS – near edge X-ray absorption fine structure spectroscopy) for material and elemental identification in the extreme ultraviolet (EUV) and soft X-ray (SXR) spectral region. The absorption spectroscopy is a very powerful tool for investigations of the near-edge x-ray absorption fine structure (NEXAFS) for elemental and chemical analysis of various samples. In the proposed project the investigations will be carried out using compact sources, instead of large scale facilities, on various samples, including organic, biological and inorganic samples for applications in biology, bioengineering, medicine, material science and nanotechnology. Long term goal of our project is to encourage scientists from various fields of science and technology to apply such compact spectroscopy method in their pursuits, to gain new knowledge and insights about various samples and for variety of applications. The results of the project will allow in forthcoming future the development of high spectral resolution, compact, desk-top spectroscopic tool, operating in the EUV/SXR spectral range, for applications in science and technology, to acquire more complete and complementary information about objects studied. The project will also help to expand the knowledge and experience in the field of biology, bioengineering, materials science and nanotechnology and to answer some important questions related to possibility to perform EUV and SXR absorption spectroscopy with compact sources, as well as to find if such systems will be interesting to the scientific community.

In this project we are proposing to perform EUV and SXR spectroscopy for much lighter elements such as carbon, oxygen, nitrogen, calcium, manganese and praseodymium; most of them being compounds of much more complicated molecular structures such as organic materials, proteins, DNA, being a framework of organic chemistry and all living organisms. Thus, we hope to gain new insights and knowledge which may significantly contribute to obtain new answers for very important questions posted by scientists from variety of scientific disciplines.

Our novel approach is to employ much more compact sources, such as unique double stream gas puff target EUV and SXR sources. Those sources are experimental and unique, allowing performing similar to synchrotron measurements on a table-top. Although the synchrotron sources are state-of-the-art systems, they are large-scale installations (facilities), expensive to maintain, difficult to access and, unfortunately, impossible to commercialize, making impossible in the future for the direct transfer of the technology to science, industry and everyday life. Thus, we focus our effort to employ compact sources and our goal in this project is to use compact sources in our spectroscopic experiments to widespread such spectroscopy techniques to everyone and to overcome limitations of large scale facilities.

The work plan is to develop the EUV and SXR sources for X-ray spectroscopy, prepare the experimental EUV/SXR spectroscopic systems based on Nd:YAG lasers of various energies and nanosecond pulse duration, perform spectroscopic investigations of organic, including biological and inorganic samples, elemental mapping in the investigated samples. If possible, we would like also to perform comparison studies with our colleagues, employing discharge based EUV/SXR source located at the CTU in Prague - Prof. Jiri Limpouch group from the Department of Physical Electronics, Czech Technical University in Prague. We will also collaborate with Prof. Krystyna Jabłońska (IF PAN, Warsaw) – a world renown specialist in the X-ray spectroscopy.