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Application of laboratory-based high energy resolution X-ray spectroscopy to study the electronic structure of hybrid plasmonic-protein systems

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Therapy and diagnosis of many diseases, cancer particularly, still remain insufficient as the methods lack specificity and effectivity. For this reason, some new systems are under development, such as plasmonic-based materials to explore their enhanced optical response. Plasmonic materials are based on metal nanoparticles which can be linked to protein with biological activity. Determination of electronic structure of such systems is important to understanding hybrid plasmonic-protein function. Studies of electronic configuration and hybrid-system structure with atomic sensitivity is necessary for development of materials with enhanced stability for biomedical applications.

High resolution X-ray spectroscopy allows to determine the electronic structure with elemental sensitivity and with ambient environment. The aim of the research is to synthetize and to determine the electronic structure of a hybrid system in accordance with its chemical environment and eventually to develop a stable, functional platform for drug or other factors for therapy and diagnostics in vitro delivery, with potential for in vivo application. In this work, electronic structure of synthesized metallic-protein system will be examined using X-ray absorption spectroscopy (XAS) and absorption of ultraviolet visible light (UV-VIS).

The analysis of the proposed system will serve as a first step toward designing new biomedical therapeutic and diagnostic materials.

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