



From bronze age swords to nuclear fuel rods to fusion energy -the upcoming prospects of laser-driven secondary sources

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The rapid development of modern laser technology has made secondary sources applicable to research and use in the energy market. Short-pulse laser driven sources of energetic photons, ions and neutrons are being used to detect the structure of matter, the composition and the transient behavior of complex objects and can serve to solve future energy demands for mankind.

For example, the common thing about a bronze age sword and a nuclear fuel rod is that people really want to know what is inside and they really don't want to open it. Neutrons are an ideal tool to get information about the isotopic composition of a sample in a non-destructive way. At the LOEWE International Center for Nuclear Photonics we have specialized in high-energy, mono-energetic gamma beams and laser-driven neutron sources to, among others, tackle this problem. We have tested laser-driven neutron sources for radiography as well as neutron resonance transmission spectroscopy. We will report on latest results as well as on detailed calculations for upcoming laser systems. We further will describe how a laser-driven source could be used for security purposes. The latter application is also recognized by the IAEA and was subject of recent meetings at the UN.

For the use of intense secondary sources in fusion energy recent new concepts show the prospect to reach fusion conditions with high gain, while circumventing some of the present obstacles in inertial fusion energy. We will address recent concepts and efforts to bring fusion energy to reality in the coming decades.