Laser-produced Au nanoparticles as X-ray contrast agents for diagnostic imaging

Name: Emanuela Esposito
Affiliation: Department of Chemical, Biological, Pharmacological and Environmental Sciences, University of Messina, Messina, Italy

Particular interest is devoted to Au nanoparticles (Au NP) due to the atomic weight of Au, their high biocompatibility and chemical passivation, and electronic density. Au significantly changes the absorption of X-rays during radiography; if suitably introduced into liquid and biological tissues, it may produce high-contrast imaging of biological systems and enhances the absorbed dose during radiotherapy expositions.

The image contrast produced by Au may be higher than the one of iodine due to its higher mass X-ray absorption coefficient; Au NPs do not induce severe adverse effects in patients during their injection, and due to their small size, they may travel through the microscopic capillaries of the circulatory system, facilitating their intravenous use. We propose a method for the preparation of Au nanoparticles using the pulsed laser ablation of solid Au targets placed in liquids; they were investigated using optical spectroscopy, SEM and TEM, and the enhancement of contrast and radiotherapeutic dose in X-ray diagnostic imaging. The contrast enhancement in colon, bladder, and kidney from mice clearly point out to a quick clearance of the body on the time-scale of hrs. During decay, the diagnostic images result of high interest for the description of the biofunctionality of the organism or of specific excretion organs. Within decay time, it is possible to use radiotherapy in order to have an optimization of the effect localized in colon, bladder, and kidney. Our studies concerning the dose of ionizing radiations released to the tissues containing the Au NPs result very useful.