Inventors surprisingly discovered and now herein describe that hafnium oxide is able, when properly used in combination with metallic material, to render said metallic material, in particular gold, non toxic, without being detrimental to the metal therapeutic and diagnostic properties, thereby rendering the product of the invention advantageously usable *in vivo* in a mammal.

Inventors further believe that the claimed combination of metallic and hafnium oxide materials may be responsible for an efficient deposit of energy within the tumor structure said deposit being responsible for the dramatical enhancement of tumor destruction *in vivo* when activated by radiations when compared to standard treatments.

## SUMMARY OF THE INVENTION

~~Inventors herein~~One aspect provides a nanoparticle comprising a metallic material at least partly covered with an hafnium oxide material or embedded therein. In a particular embodiment, the disclosed nanoparticle ~~of the invention~~ is a core-shell metal-oxide nanoparticle which comprises a metallic material fully covered with an hafnium oxide material or embedded therein. They also provide a composition comprising such a nanoparticle together with a pharmaceutically acceptable carrier. This composition may be a diagnostic composition or a pharmaceutical composition. ~~Inventors f~~Further embodiments relate to ~~describe their products~~ the disclosed nanoparticles for use in a mammal, preferably in a human being, as a diagnostic agent and/or as a therapeutic agent, in particular in oncology, more particularly when the nanoparticle is exposed to a radiation.

## FIGURES

**Figure 1** provides an illustration of the inventive nanoparticle structure.

**Figure 1A** provides an illustration of metallic crystallite or aggregate of metallic crystallites.

**Figure 1B** provides an illustration of core-shell metal-oxide nanoparticles which comprise a metallic material fully covered with an hafnium oxide material or embedded therein.

**Figure 1C** provides an illustration of nanoparticles comprising a metallic material at least partly covered with an hafnium oxide material or embedded therein.

**Figure 2** provides an illustration of the benefit over risk ratio of this inventive nanoparticle structure as compared to metallic nanoparticle deprived of hafnium oxide material, in particular in oncology, more particularly when the nanoparticle is exposed to radiations.

**Figure 3** provides a transmission electron microscopy picture of 60nm-sized gold nanoparticles from example 1.