Synergistic effect of alternating magnetic field and light conversion within Ist and IInd optical biological optical window on nanostructural ferrites for modern thermal therapies of neoplastic diseases

Currently hyperthermia is under an extensive studies as a future form of noninvasive therapy of cancer. This phenomena relies on exposition of biological tissues to elevated temperature leading to selective cell destruction. In order to induce localized temperature increase new, smart materials are necessary with high heating efficiency conversion upon action of different stimuli such as microwave irradiation, radiofrequency pulses, acoustic waves, alternating magnetic field, laser irradiation at NIR. Therefore, the main Project aim is to deliver nanostructural materials belonging to the ferrite spinel family of inorganic compounds for modern thermal therapies of neoplastic diseases by taking direct advantage out of synergistic effect of both stimulants *i.e.* alternating magnetic field and light to heat conversion of electromagnetic radiation within Ist and IInd biological window to achieve more efficient and reliable hyperthermia in neoplastic cell lines. According to data presented by American Association for Cancer Research (AACR) tumors are one of the main cause of patient death, thus all strategically directed research towards new solutions for cancer problem are of great significance and importance for social and cognitive reasons. Except development of non-contact nanoparticle platform for magneto-photothermal hyperthermia we will deliver a complex knowledge regarding influence of particle chemical composition, particle size, morphology, process parameters on final material physicochemical properties as well as extend understanding of ferrite particles mechanism of interactions with biological media (cancer cells, regular breast cells, monocytes), analysis of protein expression profiles, identification of cell stress induced by different factors, effect of nanoparticles concentration on inhibition of cell migration, determination of cell aging markers and overall action of proposed systems in breast cancer thermal therapy.