Cancers, with the cells of uncontrolled growth and spread are one of the most dangerous and difficult to treat diseases. The standard treatment procedures like e.g., chemotherapy, radiotherapy, and surgery, are aggravating the patient body and usually greatly deteriorate also the healthy cells and tissues. To minimize the side effects, often very severe, and reduce the necessity of time-consuming recovery, personalized nanotheranostic therapies for diagnosis and treatment are considered the next giant step into a better human life [1-2].

The main aim of this basic research proposal is to design, synthesize, and thoroughly characterize materials presenting two significant properties at the same time in one composition: an efficient persistent luminescence and luminescence thermometry capabilities. They will be based on perovskites intentionally triply activated with Cr^{3+}, $Ln(1)^{3+}$, and $Ln(2)^{3+}$, where Ln(1) = Sm, Eu, Yb; Ln(2) = Er, Ho, Nd ions which fulfill certain roles. **Those materials have a potential application in the optical imaging of tumor tissues and simultaneous reading of their temperature through luminescence, supporting local hyperthermia effect in personalized therapy of cancer.**

Using several spectroscopic techniques, like e.g. thermoluminescence, photoluminescence, absorption, and measuring absolute quantum yield, the properties of perovskites doped by Cr^{3+}, $Ln(1)^{3+}$, $Ln(2)^{3+}$ as a potential dual-mode materials for bioimaging with temperature reading will be investigated. The main advantages this proposal offers is that the tissues' autofluorescence as well as tissue/cell damage are completely vanished due to the replacement of the luminescence probe by persistent luminescence nanomaterials which are illuminated outside the human body and introduced afterwards. Moreover, an effective and well-defined temperature response of nanoparticles will open new possibilities of controlled local thermal therapy of tumor tissues. **This statement is extremely important for saving lives and improving its quality, but so far no one has conducted this kind of research on the perovskites materials. Therefore, the basic research presented in this proposal could open the door in the future to a new approach in nanomedicine and cancer treatment.**

References

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