# How to utilize the luminescence of well-known fluorides and phosphates – a few examples of novel approach

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While a lot of research efforts is directed towards the development and study of new and unique compounds, some of the well-known crystalline materials can benefit from novel approaches, that allow them to be rediscovered as relevant and promising materials. Fluorides like $CaF_2$ and phosphates like $LaPO_4$ are well-known and studied as host for numerous rare earth dopants. Both are characterized by simple synthesis routes and efficient luminescence. Using novel approaches and methods, they can be a rediscovered as great candidates for luminescence thermometry and UVC up-conversion. This presentation will comprise of a few examples of such approaches.

The first example are $Eu^{3+}$ doped oxyfluorophosphate glasses with a general composition 75 $NaPO_3$ - (25-x) CaO – x $CaF_2$ (with x ranging from 0 to 25 mol%). Their spectroscopic changes induced by the addition of fluorine and when applying a thermal treatment in order to grow crystals in the glasses were investigated. The heat treatment leads to the precipitation of crystals, the composition of crystal phase depends on the glass composition. Due to the changes in the $Eu^{3+}$ sites in the heat treated glasses, the heat treatment of the glass increases the absolute thermal sensitivity, but reduces the relative thermal sensitivity [1].

Another example of novel approach to well-known crystal material concerns the $Eu^{3+}$ - doped $LaPO_4$ crystals prepared using solid state reaction and added into various phosphate glass melt before quenching. the thermometric sensitivity of the $Eu^{3+}$ ions can be enhanced by adding the $LaPO_4$:$Eu^{3+}$ crystals into phosphate fluoride glasses due to special separation of the crystallites during the composite preparation and also to the reduction of the self-absorption of the $^5D_1 \rightarrow {}^7F_1$ emission. The composite material is promising for applications in temperature sensing.

The last example is our new project, which goal is to create and study phosphors capable of upconverting (UC) visible and near-ultraviolet radiation to the UVC range, which will be used to inactivate microbes and viruses. The project focuses on phosphates and fluorides like $LaPO_4$ [2] or $NaYF_4$ [3]. The obtained phosphors can be used to construct a UVC light source excited by LEDs or solar excitation.

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