Popular scientific summary

Persistent luminescence, also known as afterglow, is a fascinating phenomenon where certain materials emit light for an extended period after exposure to an energy source, such as ultraviolet light or X-rays. Unlike conventional phosphorescence, which lasts only a few seconds, persistent luminescent materials can glow in the dark for hours. This captivating phenomenon has garnered significant interest due to its potential applications across various fields. While persistent phosphors emitting visible or near-infrared light are well-known, the development of materials that glow in the ultraviolet C(UVC) range remains a relatively unexplored area. UVC radiation has attracted considerable attention for its ability to destroy harmful microorganisms and damage the DNA of cancer cells, making it valuable for applications in photodynamic therapy.

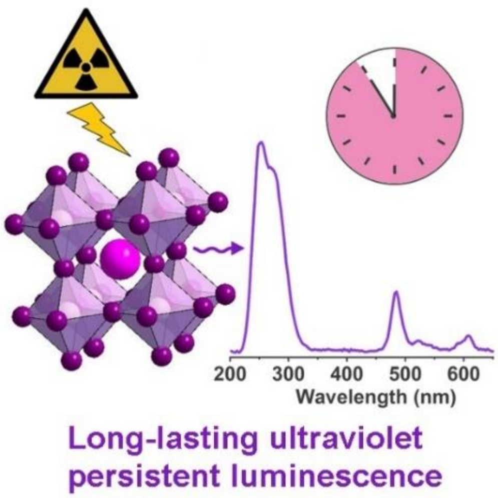

Figure 1 Graphical abstract.

Our research aims to push the boundaries of persistent luminescence by developing novel materials doped with praseodymium (Pr^{3+}), capable of emitting light in the UVC range (100–280 nm). This project holds the potential to revolutionize fields such as healthcare and environmental sanitation. Persistent phosphors emitting UVC light offer a promising alternative for cancer therapy. By combining traditional X-rays with UVC-emitting nanoparticles, it may be possible to target cancer cells more effectively, potentially reducing the required dose of radiation therapy.

In this study, we focus on fluoride- and chloride-based materials with a perovskite structure activated by praseodymium (Pr^{3+}). A deep understanding of the interactions between energy traps and luminescent centers will facilitate the optimization of these materials' performance. The research will concentrate both on the development of new materials and on exploring the fundamental mechanisms of persistent afterglow. The creation of efficient UVC-emitting persistent phosphors will address key challenges in healthcare, environmental protection, and beyond. In addition to UVC emission, Pr^{3+}-doped materials can emit light in the visible and near-infrared ranges, opening up opportunities for bioimaging and anti-counterfeiting technologies. Thus, this project represents an exciting step forward in the search for advanced luminescent materials, and its outcomes will not only expand the scientific understanding of persistent luminescence but also pave the way for innovative applications across various domains.

Persistent luminescence is a "glow that lasts", lighting up a bright future for humanity!