Novel Long-Persistent Near Infrared Phosphors for Efficient Solar Energy Absorption and Conversion

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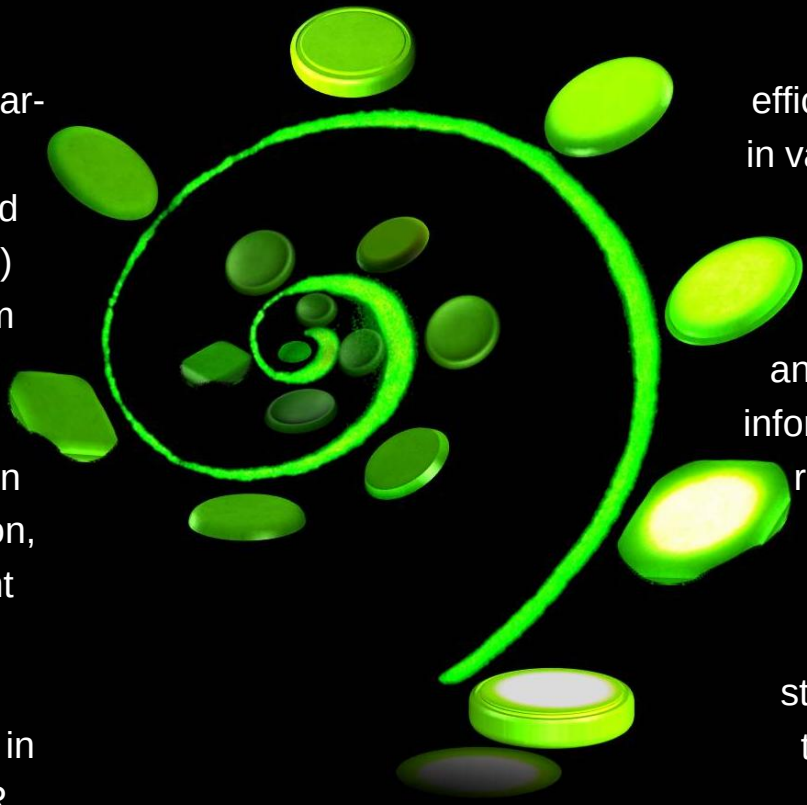
We develop two novel series of Cr^{3+}-activated gallate-based near-infrared (NIR) long-persistent phosphors: one is Cr^{3+}-activated zinc gallogermanate (ZGGO:Cr) and one is Cr^{3+}-activated lithium gallates (LGO:Cr). These two series of phosphors exhibit superior capabilities in excitation energy (UV to visible) absorption, storage, NIR (650–950 nm) light conversion, and persistent NIR light emission. Seconds to minutes of activation can result in days to weeks of persistent NIR light emission.



The ZGGO:Cr phosphors can be efficiently activated by solar radiation in various outdoor environments. The LGO:Cr phosphors can act as an superb optical memory medium for optical information write-in and read-out. In LGO:Cr, the optical information written by UV light can be read out as a NIR photostimulated persistent luminescence (PSPL) under the stimulation of a visible light or a NIR light, and such stimulation can be repeated tens of times within a period of more than 1,000 h. The NIR PSPL is a new optical read-out form.

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The ZGGO:Cr and LGO:Cr phosphors can act as luminescent convertors in photovoltaics, identification taggants in defense and security, optical probes for *in vivo* deep-tissue bio-imaging, and optical memory media for optical information write-in and read-out.