Ultrafast luminescence of doped RE^{3+} by plasmonic nanocavity

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Rare earth doped luminescence has many properties of narrow band and multicolor, which has been widely used in energy-saving lighting, special light sources, biomedical imaging, optoelectronic information. Due to 4f electronic shielding and f-f forbidden transition effect, the fluorescence lifetime of rare earth ions is long and the quantum yield is low, which is hard to meet the high-frequency control requirements of the next generation optical interconnect and quantum communication. Here, the luminescent properties of rare earth doped nanomaterials are improved by using plasmon near-field enhancement, localized and thermal effects. By constructing a plasmonic tilted nanocavity, the fluorescence properties of rare earth doped nanoparticles have been improved in frequency and time domain, and the luminescence lifetime is compressed to the nanosecond level. In addition, micro/nanocrystal structure can be in-situ and rapidly optimized by plasmonic photothermal effects, which is used to develop an application on all-optical storage.

Short Bio:

Zhenglong Zhang works as a Professor of Physics at the College of Physics and Information Technology, Shaanxi Normal University. He won the top ten advances of Chinese Optics in 2022, an outstanding reviewer for Light: Science & Applications in 2017, and was approved by the National Young Fellow, and the Av-Humboldt Fellow of Germany.