Migration-based energy storage and luminescence

Does energy migration facilitate energy transport over a long distance?
Unlike energy transfer,energy migration is able to facilitate energy transport over a long distance(Fig. 1b) 20. The manipulation of energy migration among Yb sublattice can produce color-switchable emissions 20,21,22,23 and tunable lifetimes across a wide range 24,25.

Why is energy migration important?
Energy migration is an essential process in numerous systems,such as natural photosynthetic proteins,artificial polymers,and inorganic optical materials1,2,3.

Does energy migration occur simultaneously with energy transfer in a sensitizer-activator system?
We show that energy migration indeedoccurs simultaneously with energy transfer in a sensitizer-activator system and the competition between them can be quantified by proposing a characteristic ratio parameter. Moreover,this model is also able to realize the color-switchable photochromic upconversion by temporal control of up-transition processes.

Does topological arrangement enhance upconversion luminescence?
Here,we report an inorganic optical nanosystem composed of NaErF 4 and NaYbF 4,in which topological arrangement enhanced upconversion luminescence. Three architectures are designed for considerations pertaining to energy migration and energy transfer within nanoparticles: outside-in,inside-out,and local energy transfer.

Which structure produces maximum upconversion luminescence?
The outside-in architectureproduces the maximum upconversion luminescence,around 6-times brighter than that of the inside-out at the single-particle level. Monte Carlo simulation suggests a topology-dependent energy migration favoring the upconversion luminescence of outside-in structure.

Which energy transfer pathways were added in the simulation?
The energy transfer pathways from sensitizer (Yb 3+) to activator (Er 3+) in the interlayerwere added in the simulation,leading to high non-radiative and radiative recombination rates from Er 3+and a decline of upconverted emission from Tm 3+in the core region. The details are provided in the Supplementary Information.

In this paper we review relevant theoretical and spectroscopic results and demonstrate how to tune the rise and decay profile of upconversion luminescence based on energy migration path ...

In this work, luminescence properties of silver clusters in a silica-based glass were analyzed by using steady-state and time-resolved spectroscopy. The obtained results suggest that ...

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Lanthanide (Ln)-doped upconverting nanocrystals (LnNPs) exhibit suitable features as energy donors for Förster resonance energy transfer (FRET). The sensitivity of biosensors can be ...

Smart control of energy interactions plays a key role in manipulating upconversion dynamics and tuning emission colors for lanthanide-doped materials. However, quantifying the energy flux in ...

The interaction between multiple Ln ions results in significant energy migration and storage in the Yb sensitizer network, which is often recharged with the energy of the Er ions when they emit ...

Upconversion is a process in which one photon is emitted upon absorption of several photons of lower energy. Potential applications include super resolution spectroscopy, ...

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