Strategies to Improve Performance of the Up/Down Converting Luminescence Materials for Solid-State Lighting Applications

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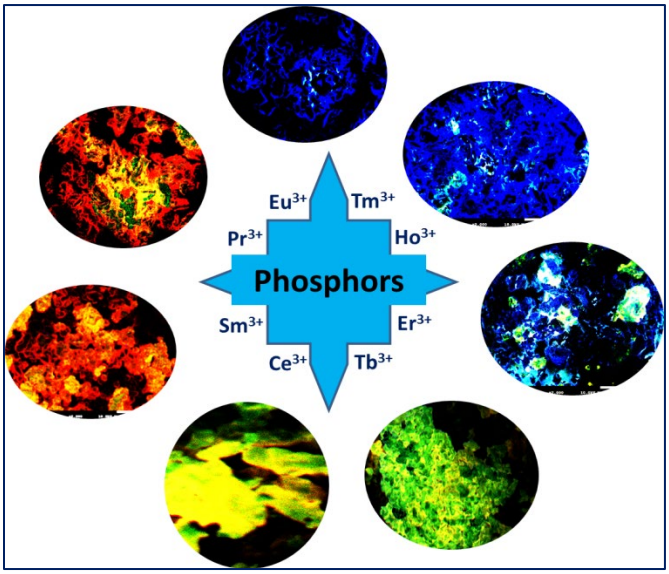
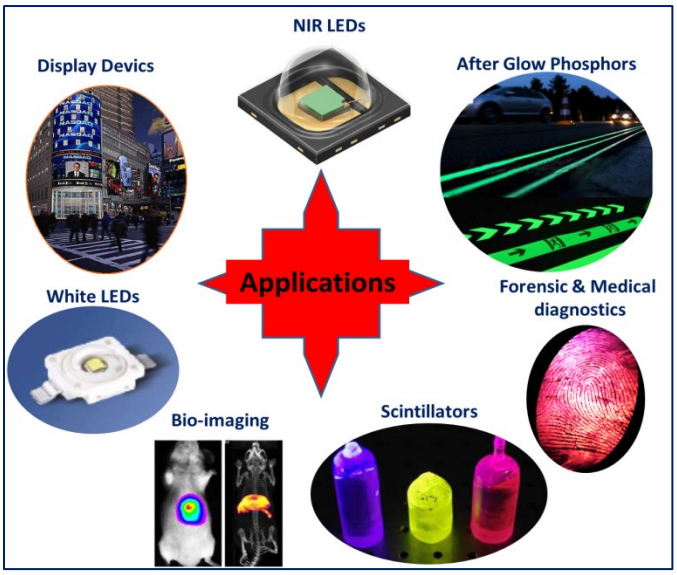
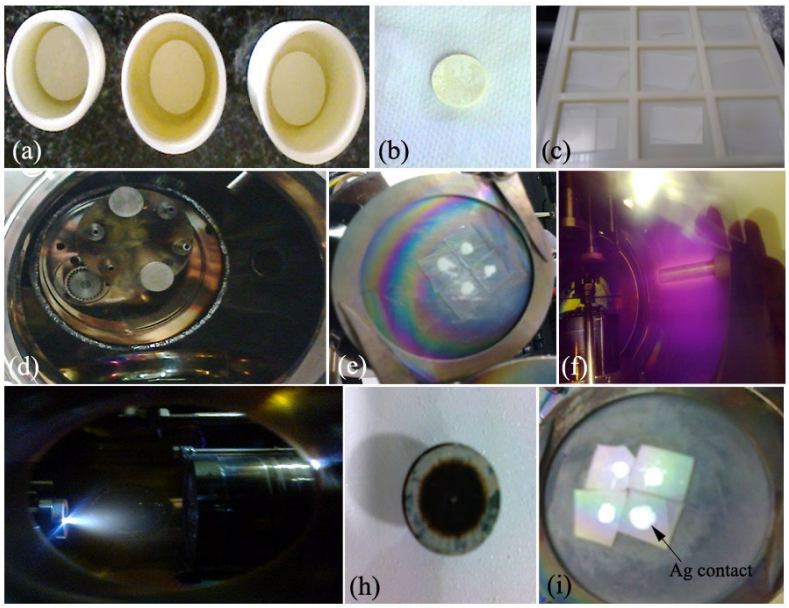




The concept of luminescence was introduced by a German physicist, Eilhardt Wiedemann, in 1888. According to the International Union of Pure and Applied Chemistry (IUPAC), luminescence can be defined as *"Spontaneous emission of radiation from an electronically or vibrationally excited species not in thermal equilibrium with its environment"*. Owing to the increase in global demand for solid-state lighting appliances, energy-saving light sources are much needed and evaluated together with the performance of the phosphors used in them. Researchers are exploring new methodologies for synthesizing luminescent phosphors to improve their up/down converting luminescence properties. The luminescent phosphors are also known as 'light-bearing materials' are widely used in various potential applications such as WLEDs, NIR LEDs, solar cell, display devices, imaging systems, scintillators, forensic science, imaging blood vein distribution and medical diagnostics, biological labeling, indoor

plant cultivation, optical communication, night-vision security signs, therapeutics, lumino-magnetic applications, etc.

He worked in novel strategies to synthesize phosphors with special reference to luminescent materials and investigated their structure-property relationship for the application in solid-state lighting and display devices. He has research interests in optimizing the growth conditions of semiconductors, insulators, and transparent ceramics using a high-temperature solid-state method; and various wet chemical synthesis methodologies such as low-temperature solid-state meta-thesis, hydrothermal, solvothermal, sol-gel, combustion, precipitation method, spin-coater; and thin film deposition using chemical bath deposition, dip-coating, pulsed laser deposition, DC Sputtering, e-beam evaporation, etc. His current areas of research interest include synthesis of lanthanide and/or transition metal ions activated phosphors and improve/explore their photoluminescence excitation and emission properties, Infra-red emission properties, excited-state energy transfer mechanism, fluorescence decay time, quantum yield measurements, CIE chromaticity coordinates, color rendering index, correlated color temperature, etc. He presented his research works in national, international conferences, workshops, invited talks, guest lectures and he has a strong publication track record and published articles on phosphors in high-quality journals.



Photograph of various experimental procedures adopted in Pulsed Laser Deposition technique (a) pelletized ceramic target, (b) annealed target, (c), substrate cleaning, (d) target loading, (e) substrates loading, (f) removal of impurities in UHV chamber (glow discharge), (g) laser ablation, (h) ablated target, (i) as-deposited thin films.