



Dr. Prasenjit Prasad Sukul is a post-doctoral researcher at the Department of Physics, University of the Free State, Bloemfontein, South Africa working in the Sarchi chair Advanced and Luminescent Materials research group. His research activities are focused on advanced engineering on ultra-sensitive luminescence phosphors for display device applications using rare earth ion doped luminescent materials. He has completed his PhD in Physics from Indian Institute of Technology, Dhanbad, India and later joined Prof. Swart's research group. He has his research interests in photoluminescence spectroscopy, time resolved optical spectroscopy; rare earth phosphors, upconversion nanomaterials, laser materials.

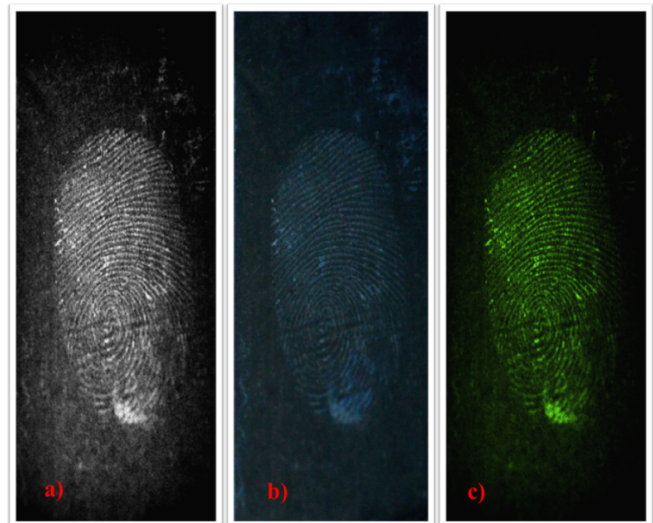
Introduction

Research Goals

The goal is to develop a series of ultra-sensitive nano phosphors using novel synthesis techniques, luminescence optimization of the synthesized phosphors, spectroscopic data analysis, and designing the phosphors for various applications e.g. radiation detection, optical temperature sensing, luminescent solar cell concentrators, upconversion imaging & microscopy, security ink & cyphers, hyperthermia detection etc.

Recently, rare earth ions (RE^{3+}) doped upconversion-fluorescent nanoparticles (UCNPs) have received considerable attention due to their special anti-stokes photofluorescent properties, compared with the traditional down-shifting and down-conversion fluorescent materials. Lanthanide ions (Ln^{3+}) doped UCNPs have sparked great attention for their novel applications such as drug delivery, photodynamic therapy, biological imaging, point temperature sensing, invisible ink for anti-counterfeiting, latent fingermark detection, near infrared photocatalysis for water purification etc. It can be seen that there has been an exponential increase in research interest on these upconversion fluorescent materials from last decade, which is still growing today.

Fingerprint detection using UCNPs



(a) Exposed to black & white filter (b) UV excitation (350 nm) (c) IR excitation (980 nm)