



# Centre for Biosystems Science and Engineering

# SEMINAR

at 4:00 PM on February 4, 2016  
Lecture Hall, Materials Engineering

## Biological Materials: How to make non-toxic, functional, Protein-based Nanoparticles?

**Prof. Challal Vijaya Kumar**

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IPC Department, Indian Institute of Science India

Fluorescent, white-emitting, protein-based, metal-free, stable and pH sensitive nanoparticles (GlowDots) will be presented. Crosslinking of amine and carboxyl functions of bovine serum albumin (BSA) resulted in the facile formation of protein nanoparticles which are then conjugated with specific organic dyes to produce white-emitting particles. Chemical novelty of this work is that the particle size, size distribution, stability, and absorption/emission peak positions are under chemical reaction control. The particle size had a major size fraction of 36 nm (92 %) and minor size fraction 5 nm (8 %) as observed by dynamic light scattering and confirmed by transmission electron microscopy. Particles were thoroughly characterized by gel electrophoresis, electron microscopy, and optical spectroscopy. One advantage with these nanoparticles is that they are biocompatible and non-toxic, as they are derived from an edible protein. Due to their intense white-emission, they can be interrogated at multiple wavelengths for imaging and sensing applications. White fluorescence, for example, is strongly sensitive to the pH, and changes could be detected visually and quantitatively over a wide pH range of 2 through 13. Similar examples of non-toxic, functional materials will be presented.

### About the speaker:

Dr. Challal Vijaya Kumar, a professor at the University of Connecticut, has spent his life investigating chemistry and trying to find ways to apply it to common problems. Earning his doctorate degree from Indian Institute for Technology (Kanpur), he went on to complete a postdoctoral study at the University of Notre Dame where he examined fast dynamics of excited states at the Radiation Laboratory. He then accepted a research fellow position at Columbia University in New York City under Drs. Jackie Barton and Nicholas Turro. There, he discovered game-changing information about the electron transportation along the DNA backbone. Since then, he has been a professor at the University of Connecticut where he runs a research lab and directs graduate students in their advanced research studies. Recently, his research has focused on “edible” solutions to many problems such as solar cell materials, light harvesting antennas for solar energy, and non-toxic nanoparticles for imaging and medical applications. “Edible”, a term he uses to describe his passion for non-toxic materials, refers to the biologically friendly makeup of his research.