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# Materials Science and Engineering

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### Generating efficient and tunable white light using electronically coupled nanocrystal and molecular building blocks

Native defects, including lattice site vacancies and interstitials, are a source of many useful and often unexpected properties in solid-state materials. In this talk, I will first present our recent results on defect-based photoluminescence properties of colloidal wide band gap metal oxide nanocrystals ( $\text{Ga}_2\text{O}_3$  and  $\text{ZnO}$ ), and the effect of nanocrystal size on the photoluminescence energy, efficiency and dynamics. Coupling of the native defects with selected molecular fluorophores bound to nanocrystal surfaces via energy transfer allows for the emergence of complex optical properties. One of the examples that will be discussed is generation of white light that can be tuned based on the nanocrystal size and the concentration of luminescent adsorbates on nanocrystal surfaces. The ability to modify nanocrystal surfaces allows for further optimization of the stability and functionality of the resulting nanoconjugates. The extension of these results to composite films consisting of photoluminescent nanocrystal energy donors and acceptors represents a path to all-inorganic rare earth element-free white-emitting phosphors. The implications of this work for high-efficiency photonic devices, such as white light emitting diodes, will also be discussed.

### Biography

Pavle V Radovanovic received his PhD degree from the University of Washington, Seattle. Following his Post-doctoral appointment at Harvard University, he started his independent research career at the University of Waterloo in 2006. At Waterloo, he initiated a new research program in physical-inorganic chemistry focusing on the design, synthesis and fundamental physical and chemical properties of multifunctional low-dimensional materials. His work has been recognized by number of honors and awards, including Canada Research Chair (NSERC), Early Researcher Award (Ontario Ministry of Research and Innovation), Mobility Award (French Ministry of Foreign Affairs) and CNC-IUPAC Award.

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