

Presentation title : Dual-mode colorimetric/fluorescent chemosensor for Cu²⁺/Zn²⁺ and fingerprint imaging based on rhodamine ethylenediamine bis(triazolyl silsesquioxane)



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Abstract (250-300 words):

The design and synthesis of novel nanoscopic molecule that can, on dual basis, not only for recognition of biorelevant metal ions but also to detect fingerprints represent unique scientific approach. We recently pioneered the synthesis of fluorescent labelled triazolyl Polyhedral Oligomeric Silsesquioxanes (POSS) for applications in fingerprints imagings [1,2] with good selectivity, sensitivity and legibility.

As we engaged in unprecedented advances vis-à-vis proof of concept of our ongoing work, we re-designed and synthesize dual functional Rhodamine labelled bis(triazolyl) POSS (RBS) using “click chemistry” for selective sensing of Cu²⁺/Zn²⁺ and extended the applications to fingerprint imaging via (RBS-M²⁺)-amino acid interaction.

The results have demonstrated that RBS can act as fluorescent and colorimetric sensing of Cu²⁺ and Zn²⁺ by their respective coordination with triazole structures and, more importantly, it has also been found that triazole-amide of RBS could turn-on chelation-enhanced fluorescent (CHEF) of Cu²⁺. Remarkably, the addition of Cu²⁺ triggered an enhanced fluorescent emission by 63.3-fold ($\phi_F = 0.41$) while Zn²⁺ enhanced 48.3-fold ($\phi_F = 0.29$) relative to the original RBS ($\phi_F = 0.006$) in acetonitrile (MeCN) solvent. The fluorescent limit of detection for Cu²⁺ and Zn²⁺ are similar and fall within 3.0 nM, while under colorimetric sensing, responses were 2.14×10^{-8} and 4.0×10^{-8} mol L⁻¹, respectively. Moreover, the effective sensing profile of RBS and, extended applications of RBS-Cu²⁺ and RBS-Zn²⁺ for fingerprinting detection and imaging were observed with adequate sensitivity, stability and legibility under the dual visual responses.

Biography (150-200 words):

Enock Dare is a Professor of Nanotechnology and Materials at the Federal University of Agric. Abeokuta, Nigeria. He holds a Ph.D. in Chemistry from the University of Ilorin, Nigeria, and an Advanced Research Diploma in Chemical Engineering from the Tokyo Institute of Technology, Japan. Postdoctoral training at Princeton University, NJ, USA. He is a UNESCO and MONBUSHO fellow (Japan); FULBRIGHT and USAMI fellow (Princeton University, USA); Taiwanese National Science Foundation fellow (Taiwan); Alexander von Humboldt fellow. He has made excellent research output in Hybrid nanocomposites based on POSS, nanoporous membrane technology, transdermal drug delivery, nano bimetallic for sensor and catalysis, green nanotechnology, nanobiotechnology, etc. His most current research lies on “nano-enabled materials for anti-counterfeiting, fingerprinting for criminality detection