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Turning photo-physical and electrochemical properties of cationic iridium (III) complexes based on 4-methoxyphenylvinylquinolines for organic light emitting devices for lighting

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Four novel highly luminescent cationic homoleptic Ir (III) cyclometalated complexes of the type [Ir(NAC)₃]PF₆ based on derivatives of 4-methoxyphenylvinylquinoline containing electron donating and withdrawing groups as aryl-substituents at 2-position of the quinoline scaffold were designed, synthesized and characterized. While the ligands were initially prepared via palladium catalyzed Suzuki-Miyaura cross-coupling of the 2-aryl-4-chloroquinoline, cyclometalation of Ir(III) complex was accomplished in one-pot reaction method. The compounds were characterized by employing various techniques such as FT-IR, ¹H and ¹³C-NMR, UV-Vis, PL and cyclic voltammogram. In methanol, all complexes display strong spin-allowed ¹MLCT (singlet metal-to-ligand charge transfer) absorption bands between λ_{abs} 315-380 nm. The photoluminescence properties of the ligands measured in solvents of different polarity with excitation wavelength of λ_{ex} 350 nm were color-tuned by modification of wavelengths displaying a red-shift emission from λ_{em} 438-479 nm compared to λ_{em} 489-545 nm in the corresponding complexes. Enhanced fluorescence intensities and high quantum yield were observed in chloroform and methanol unlike in dimethyl formamide (DMF). The cyclic voltammetry properties of the complexes relative to a ferrocenium/ferrocene redox couple showed a metal-centered to be redox-active in nature, which clearly support the introduction of electron-releasing groups raising the HOMO energy level in phosphorescence of iridium(III) complexes. It is suggested that the synthesized homoleptic iridium complexes may be efficiently used on the basis of enhanced PL intensities as emissive dopants in nano-sensing of biological molecules and/or suitable red-emitting materials for OLEDs applications.

Biography

Adewale O Adeloje has completed his PhD from University of Fort Hare, Alice, South Africa and Post-doctoral studies from University of South Africa, College of Science, Engineering and Technology, South Africa. He is a Senior Researcher in Natural Resources and Materials Department, Botswana Institute for Technology Research and Innovation (BITRI), Gaborone, Botswana. He has published more than 30 papers in reputed journals and serving as a reviewer of repute.

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