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TiO_2 based nanoparticles as solid support for chemiluminescence detection: A range of analytical applications

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This work describes a novel approach for analytes detection using $Ru(bpy)_3^{2+}$-Ce(IV) chemiluminescence (CL). Herein, we report the synthesis, characterization and application of a new type of hybrid nanoparticles (NPs). Mesoporous TiO_2-$Ru(bpy)_3^{2+}$ NPs were prepared using a modified sol-gel method by incorporating $Ru(bpy)_3^{2+}$ into the initial reaction mixture at various concentrations. The resultant bright orange precipitate was characterized via: TEM, N_2 sorptometry, ICP-OES, Raman and UV-Vis techniques. For comparison purposes, the concentration of $Ru(bpy)_3^{2+}$ incorporated in the NPs was quantified and compared to the same concentration of $Ru(bpy)_3^{2+}$ in solution in terms of the CL response. The results showed this type of hybrid material exhibited higher CL signal compared to the liquid phase due to the enlarged surface area of the TiO_2-$Ru(bpy)_3^{2+}$ NPs. The solid-state system was optimized using oxalate as a model compound. The amount of TiO_2-$Ru(bpy)_3^{2+}$ NPs and the effect of the oxidant flow rate were investigated. Subsequently, the optimized system was used to detect imipramine and bromazine. A linear range was obtained for both drugs at concentrations 1-100 pm. This approach is considered simple, low cost, facile and can be applied to a wide range of analytes.

Biography

Entesar Al-Hetlani completed her PhD in 2013 from Hull University, UK. She is an Assistant Professor at Kuwait University, Kuwait. Her research focuses on nanomaterials synthesis and applications for Forensic and Analytical Applications.

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