

Evaluation of the Appropriateness of Common Oxidants for Ruthenium (II) Chemiluminescence in a Microfluidic Detection Device Coupled to Microbore High Performance Liquid Chromatography for the Analysis of Drugs in Formulations and Biological Fluids

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Abstract : In this work, we evaluated the appropriateness of various oxidants that can be used potentially with Ru(bipy)₃²⁺ CL system while performing CL detection in a microfluidic device using eight common active pharmaceutical ingredients- ciprofloxacin, hydrochlorothiazide, norfloxacin, buspirone, fexofenadine, cetirizine, codeine, and dextromethorphan. This is because, microfluidics have very small channel volume and the residence time is also very short. Hence, a highly efficient oxidant is required for on-chip CL detection to obtain analytically acceptable CL emission. Three common oxidants were evaluated, lead dioxide, cerium ammonium sulphate and ammonium peroxydisulphate. Results obtained showed that ammonium peroxydisulphate is the most appropriate oxidant which can be used in microfluidic setup and all the tested analyte give strong CL emission while using this oxidant. We also found that Ru(bipy)₃³⁺ generated off-line by oxidizing [Ru(bipy)₃]Cl₂·6H₂O in acetonitrile under acidic condition with lead dioxide was stable for more than 72 hrs. A highly sensitive microbore HPLC- CL method using ammonium peroxydisulphate as an oxidant in a microfluidic on-chip CL detection has been developed for the analyses of fixed-dose combinations of pseudoephedrine (PSE), fexofenadine (FEX) and cetirizine (CIT) in biological fluids and pharmaceutical formulations with minimum sample pre-treatment.

Keywords : oxidants, microbore High Performance Liquid Chromatography, chemiluminescence, microfluidics

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