

Determination of thiol compounds using a new technique in microfluidics-chemiluminescence methods

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The quantification of thiol compounds especially bio-thiols is very important to provide information about their physiological roles and early diagnosis for some human diseases. For this purpose, developing a method with high selectivity, sensitivity, short analysis time per sample and less consumption of reagents is a demand. Therefore, a new technique for the analysis of thiol compounds has been proposed using microfluidics – chemiluminescence (CL) systems. The CL system of tris(2,2'-bipyridyle) ruthenium(II) (Ru(II) bipy) was utilized. Two oxidation methods were compared, Chemical oxidation using Ce(IV) and photo-induced oxidation using peroxydisulphate and visible light. Different thiol compounds were included in the optimization process like cysteine, N-acetylcysteine, Glutathione and Captopril. For both types of oxidations the experimental conditions were optimized and the effects of the pH and buffers on the CL systems were investigated. Under optimized conditions, ammonium formate buffer with 160 mM concentration and pH value of 3.5, the sensitivity of the (Ru(II) bipy) CL system was found to be superior when photo-induced oxidation was used. The ratio of CL signal when chemical oxidation is used compared to photo-oxidation 5.8, 4.8, 2.4 for N-acetylcysteine, Cysteine and Captopril respectively.

The ultimate objective is to develop chromatographic conditions for thiols separation and coupling of the proposed detection method to micro-HPLC. This will allow a direct application to be carried out on biological samples.