

光谱学与光谱分析

锰(II)-胡椒碱-溴化十六烷基三甲基胺三元体系的荧光特性及应用

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摘要 The fluorescence characteristics of the complex of piperine with cation in micellar system were studied. At the same time, the influence of experimental condition on the fluorescence intensity was also studied. The experiments indicated that piperine had very low fluorescence signal itself. But in pH 8.77 $\text{Na}_2\text{HPO}_4\text{-NaH}_2\text{PO}_4$ buffer solution, both $\text{Mn}(\text{II})$ and cationic surfactant cetyltrimethylammonium bromide can enhance the fluorescence intensity and stability of piperine. Based on this, a sensitive method has been developed for the quantitative determination of piperine in $\text{Mn}(\text{II})$ -piperine-cetyltrimethylammonium bromide ternary system. Under the optimum conditions, there is a linear relationship between the enhancement of fluorescence intensity and the concentration of $\text{Mn}(\text{II})$. The optimal conditions are as follows: the concentration of $\text{Mn}(\text{II})$ is $2.5 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1}$ and the concentration of cetyltrimethylammonium bromide is $5 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1}$. The fluorescence intensity was determined by a 1 cm quartz cell with the excitation wavelength of 352 nm and the emission wavelength of 452 nm. The linear range of concentration of piperine was 2.02-10.1 $\mu\text{g} \cdot \text{mL}^{-1}$ with the relative coefficient of 0.998 5 and the detection limit of 0.060 2 $\mu\text{g} \cdot \text{mL}^{-1}$. The relative standard deviation (RSD) was 1.10%. The proposed method has been successfully applied to the quantitative determination of piperine in the Mongolian medicine Piper longum L, and the recovery was within the range of 97.6%-102.0%. The results were very satisfactory.

关键词 [研究了金属离子存在下胡椒碱在胶束体系中的荧光特性及实验条件对荧光强度的影响。结果表明:胡椒碱本身具有较弱的内源性荧光,在pH 8.77的 \$\text{Na}_2\text{HPO}_4\text{-NaH}_2\text{PO}_4\$ 缓冲溶液中,加入锰离子和阳离子表面活性剂溴化十六烷基三甲基胺对胡椒碱的荧光具有增敏、增稳作用。据此建立了在锰\(II\)-胡椒碱-溴化十六烷基三甲基胺三元体系中测定胡椒碱的荧光分析新方法。最佳测试条件是锰离子浓度 \$2.5 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1}\$,溴化十六烷基三甲基胺浓度 \$5 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1}\$ 时,用1 cm石英荧光比色皿在最大激发波长352 nm,最大发射波长452 nm处测定其荧光强度。胡椒碱的质量浓度在2.02~10.1 \$\mu\text{g} \cdot \text{mL}^{-1}\$ 范围内,与其荧光强度呈良好的线性关系,相关系数为0.998 5,检出限为0.060 2 \$\mu\text{g} \cdot \text{mL}^{-1}\$,方法的相对标准偏差为1.10%。该方法应用于蒙药葶苈中胡椒碱的测定,其回收率为97.6%~102.0%,结果令人满意。](#)

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