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邻苯二酚紫修饰电极示差脉冲伏安法测定水中铝

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摘要 利用吸附的方法在热解石墨电极上制得邻苯二酚紫(PCV)修饰电极。在NH~3.H~2O-NH~4Cl底液(pH8.5)中,该电极具有很好的电化学活性,其示差脉冲氧化峰电位为E~p~a=+80mV。对铝进行检测,只是峰电流降低,而峰电位不变,氧化峰电流的降低值与铝浓度在1×10^-^8-1×10^-^7mol.dm^-^3和1×10^-^7-1×10^-^6mol.dm^-^3范围内成正比,检测限为5×10^-^9mol.dm^-^3,标准偏差为5.0%(4×10^-^8mol.dm^-^3Al,n=8),对实际水样进行测定,结果令人满意。对其检测机理进行了研究后认为:(1)PCV修饰电极表面是PCV单分子层吸附,具有很好的电化学活性;(2)铝与PCV在电极表面形成一1:3的配合物,该配合物在修饰电极上本身没有电化学活性,仅覆盖住原有的PCV电活性点,从而使峰电流降低,而峰电位没有变化;因此,在有铝和无铝时,电极过程没有变化,都对应于PCV的电化学行为。我们用电化学方法、扫描电镜、X射线光电子能谱和X射线荧光光谱法对此进行了证明。

关键词 邻苯二酚紫 电极 电化学分析 伏安法 铝

分类号 0651

Differential-pulse voltammetric determination of aluminum in water by a pyrocatechol violet modified electrode

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Abstract A pyrocatechol violet mdoified electrode has been fabricated by dip- coating a pyrolytic graphite electrode in a NH~3.H~2O-NH~4Cl buffer solution of PCV (pH8.5). It has good electroactivity. The anodic peak potential of differential-pulse voltammogram is E~p~a=+80mV. While adding Al, the peak current decreases and the peak potential remains the same. The decreasing value of peak current Δi~p is linear with the Al concentration in the range of 1× 10^-^8-1×10^-^7mol.dm^-^3 and 1×10^-^7-1× 10^-^6mol.dm^-^3. The detection limit is 5×10^- ^9mol.dm^-^3 and the relative standard deviation for 4×10^-^8mol.dm^- ^3 Al is 5.0% (n=8). It was applied to the determination of Al in drinking water samples to give good results. A mechanism of indirect determination of Al by PCV-CME is proposed: (1)the PCV is absorbed on the electrode surface as a monolayer. (2)Al forms an electroinactive complex with PCV absorbed on the modified electrode surface; it covers the electroactive points of the PCV monolayer, which results in the decrease in the peak current. In the absence and presence of Al, the electrochemical current responses of the electrode are always corresponding to the redox reaction of PCV. We utilized the electrochemistry, scanning electron micrograph, X-ray fluorescence spectroscopy and X-ray photoelectron spectroscopy to demonstrate this mechanism.

Key words CATECHUL VIOLET ELECTRODE ELECTROCHEMICAL ANALYSIS VOLTAMMETRY ALUMINIUM

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