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Voltammetric Determination of Ascorbic Acid and Dopamine Simultaneously at a Single Crystal Au(111) Electrode

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Abstract: A single-crystal Au(111) electrode was used for the simultaneous determination of dopamine (DA) and ascorbic acid (AA) in a phosphate buffer solution at pH 6.9. The single-crystal Au(111) electrode displayed excellent electrocatalytic activity for DA and AA oxidation in comparison to a Au disk electrode. Although the anodic peaks of both reagents overlapped on the Au disk electrode, the anodic peak potentials of DA and AA in their mixture were well separated since the peak potential of AA was shifted to more negative values by cyclic and differential pulse voltammetry. The oxidation peak current increased linearly with the concentration of DA in the range of 5×10^{-6} - 5×10^{-4} mol/L in the presence of 5×10^{-4} mol/L AA. The detection limit of DA was 5×10^{-7} mol/L. The peak current also linearly increased with increasing AA concentration in the presence of 5×10^{-4} mol/L DA in the range of 1×10^{-6} - 5×10^{-4} mol/L. The detection limit of AA was 5×10^{-8} mol/L (s/n = 3). The single-crystal Au(111) electrode showed excellent electrocatalytic activity to both AA and DA, probably because hydrogen flame treatment made the single-crystal electrode surface a well-defined atomic structure.

Key Words: Au(111) single-crystal electrode, dopamine, ascorbic acid, voltammetry, simultaneous determination

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