NICKEL-FILM BASED GLASSY CARBON ELECTRODE AS AN ELECTROCHEMICAL SENSOR FOR HISTAMINE DETERMINATION

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Abstract

In recent years, new trends in food safety together with the consumers demand for good quality and healthier products have encouraged the search for compounds with harmful repercussions on human health. Among them, the presence of histamine in fermented foods, such as sausages, wine, beer, cheese and other dairy products has received considerable interest owing to its undesirable physiological effects in sensitive humans. Histamine is a neurotransmitter and a product of the microbial degradation of the amino acid histidine due to the action of histidine decarboxylase. The formation of high levels of histamine correlates strongly with the number of microorganisms present in histidine rich foods (vegetables, fermented foods and certain fish species). At high concentrations, histamine is a risk factor for food intoxication, whereas moderate levels may lead to food intolerance. The symptoms of histamine poisoning generally resemble the symptoms encountered with IgE-mediated food allergies. The symptoms include nausea, vomiting, diarrhea, an oral burning sensation or peppery taste, hives, itching, red rash, and hypotension. Due to the potential hazardous effects to humans, the development of analytical methodology for the determination of histamine is an important subject.

In present study, electrochemical behaviour of histamine on nickel-film based glassy carbon electrode (NiGCE) investigated and a sensitive chronopotentiometric method was developed. Electrochemical oxidation of histamine at NiGCE is achievable at moderate potentials of the working electrode providing good reproducibility and sensitivity of histamine determination. Experimental parameters affecting the oxidation process, including type and concentration of supporting electrolyte, initial potential, oxidation current, temperature and concentration time, were optimized. Chronopotentiometric determination of histamine on NiGCE can be performed in wide concentration range from 0.5-110 mg/L. Using a 240 s accumulation time, limit of detection and quantitation were 0.11 mg/L and 0.29 mg/L of histamine, respectively. The results obtained offer promising evidence that the simple chronopotentiometry on a nickel electrode can be used as a convenient analytical tool for histamine determination.

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References

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