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Research Article

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Melamine selective electrode based on nanoporous carbon/molecularly imprinted polymer

Muji Harsini[1], Suyanto[1], Gustan Pari[2] and Eva Mandasari[3]

[1]Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga, Surabaya, Indonesia
[2]Research and Development Centre of Forest Product, Bogor, Indonesia
[3]Student Graduates Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga, Surabaya, Indonesia

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ABSTRACT

Potentiometric sensor of melamine based on nanoporous carbon/molecularly imprinted polymer (MIP) have been made and characterized. The purpose of research are to know the optimum conditions in the analysis of melamine and validation method. Molecularly Imprinted Polymer (MIP) is synthesized by mixing 0,2 mmol of melamine as a template, 0,8 mmol of methacrylic acid as monomer, 2,4 mmol of ethylen glycol dimethacrylate as crosslinker end 1 mmol benzoyl peroxide as initiator. Electrode is made by mixing nanoporous carbon, MIP and paraffin in the ratio of 45:20:35. From this research it is obtained optimum pH of melamine solution is 3,0-4,0, the Nernst factor is 54 mV/decade and range of measurement is 10^{-6}M–10^{-2}M. The limit of detection that can be measured by nanoporous carbon/MIP is 8,86x10^{-7} M.. The selectivity coefficient of electrode for Na^+, K^+, Ca^{2+} end Mg^{2+} ions are 2,904x10^{-6}, 6,072x10^{-8}, 2,632x10^{-9}, and 2,566x10^{-9} which means that the ion do not interfere in measurement. This electrodes coefficient is variated it is 1,06% for concentration 10^{-2}M and 2,34% for concentration 10^{-4}M while % recovery is 104,35% for concentration 10^{-4}M.

Keywords: melamine, molecularly imprinted polymer, potensiometry, nanoporous carbon

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INTRODUCTION

At the end of 2008, the world was startled by the news that the milk in People Republic of China (PRC) resulted in thousands of babies suffered kidney damage and kidney failure, four of them died. The cause of this occurrence is the presence of melamine in milk products in PRC[1]. Determination of melamine levels is mostly by liquid chromatography and tandem techniques (combined) LC-MS-MS [2,3]. This method required a very large investment and high operating costs.

A simple analysis of the potentiometric method requires an electrode as a sensor to recognize the target analyte. Electrode surface is a sensor that should contain components that react chemically with the analyte and reversible [4]. Currently, the molecularly imprinted polymer (MIP) has been developed to melamine sensor by potentiometric using modified MIP electrodes membranous PVC type of tubes [5]. However, this type of electrode needs a special skill in its manufacture and prone to leakage.

Modification of electrodes with the MIP sensor can result in a selective and sensitive to the target analytes [6]. Molecularly imprinted polymer with a analyte target as template is a technique that has grown as a sensor that is specific to a particular compound, analogs, or for the enantiomer [7]. This polymer has the advantage of being very stable in organic solvents, extreme pH, and extreme temperature [8]. The advantage of MIP is ideal as an electrochemical sensor. Development of MIP to the type of potentiometric transducer still has not much studied [9].