



## Selective melamine sensor based on nanoporous carbon paste/molecularly imprinted polymer

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### ABSTRACT

Selective melamine sensors based on nanoporous carbon paste /molecularly imprinted polymer have been studied. The study begins with the synthesis of MIP monomer mixture of methacrylic acid (MAA), and ethylene glycol dimethacrylate (EGDMA) cross linker, benzoyl peroxide initiator, and melamine template. Membrane electrodes are fabricated by mixing nanoporous carbon and MIP with a certain ratio of inserted into the electrode surface. The optimization of sample measurements which includes melamine test of pH value of a solution pH and membrane composition. Further characterization of the electrodes was done by determining the Nernst factor, measurement range, selectivity, and lifetime. Validation method was done by determining the accuracy, precision, and the detection limit. Based on the data from FTIR, has been successfully synthesized MIP with BET analysis showing that MIP has a larger surface area, a larger pore volume, and a larger pore diameter than the MIP before extraction. The optimum conditions for the analysis of melamine using potentiometric sensor of nanoporous carbon paste/MIP electrode are the ratio of nanoporous carbon, MIP, and paraffin by 45:20:35 and the optimum pH value of 3-4. Results of melamine analysis using this sensor are the measurement range of  $10^{-6}$  -  $10^{-2}$  M, the detection limit is  $9.51 \times 10^{-7}$  M, the Nernst factor is 54.4 mV / decade, the accuracies of the concentration of  $10^{-4}$  M and  $10^{-3}$  M are respectively 106.1% and 104.3%, and this electrode is selective against melamine and is relatively undisturbed by  $Ca^{2+}$ ,  $K^{+}$ ,  $Mg^{2+}$ , and  $Na^{+}$  that are usually present in milk.

**Keywords:** selective melamine sensor, molecularly imprinted polymer, carbon nanoporous, potentiometric

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### INTRODUCTION

Melamine contamination in milk is currently a problem in food safety since the milk cases in China in 2008 which resulted in thousands of kidney failure of babies and some of them died [1]. Based on these cases it is, necessary to develop analysis method of analysis of melamine which is sensitive, selective, accurate, fast, easy, and low cost.

Determination of melamine is mostly using liquid chromatographic techniques; [2] and tandem (combined) LC-MS-MS [3], [4]. However, this method takes a huge investment and high operating costs to operators as well as specialized skills.

Potentiometric analysis is a simple method that uses electrodes as sensors to identify the target analyte by measuring its potential [5]. Surface electrodes are sensors that must contain a component which reacts chemically and reversibly with the analyte [6]. This technique is inexpensive equipment, requires no special skills to operate, and easy to carry equipment that can be directly used in the field.