



University of Zabol  
Graduate school  
**Faculty of Science**  
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**The thesis**

**Submitted in partial fulfillment of the requirements  
for the degree of Master of Science**

**Application of copper (II) oxide  
nanowires coating as a sorbent in solid  
phase microextraction for the  
determination of some agricultural  
pesticides by gas chromatography  
method**

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## Abstract

In this research, an attempt has been made to introduce a solid phase microextraction (SPME) method using a new adsorbent fiber based on copper(II)oxide nanowires in order to extract and determine the amount of some agricultural pesticides. For this purpose, copper(II)oxide nanowires were first synthesized and identified on a substrate of copper wire. Then, the ability of copper wire coated with copper(II)oxide nanowires as a fiber to absorb and pre-concentrate some pesticides was measured by gas chromatography before measurement. Finally, after optimizing the factors affecting the extraction efficiency and evaluating the proposed method, the application of this method in measuring agricultural pesticides in real samples was investigated.

Based on the results that confirmed the synthesis of CuO from Cu(OH)<sub>2</sub>, as well as a regular stable structure with a high surface-to-volume ratio of copper(II)oxide nanowires after heating Cu(OH)<sub>2</sub> NWs, then Confirmed by review of FE-SEM images. Finally, copper (II)oxide nanowire fiber in direct solid phase microextraction for Butachlor extraction, which is one of the pesticides used in agriculture (especially rice), has a limit of detection 0.3 µg and a linear range of 0.1-55 ppm and an RSD% value Inter-Day and Intra-Day was 6.3 and 4.8, respectively. Based on the results of the synthesized fiber and its optimal reproducibility, it can be a suitable method for extraction and analysis.

Keywords: Agricultural pesticides, Gas chromatography, Solid phase microextraction, Copper (II) oxide nanowire