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Introduction

In the recent years, pollution of the environment by heavy metals has received considerable attention. Nickel is a moderate toxic element compared to other transition metals. However, it is known that inhalation of nickel and its compounds can lead to serious problems, including respiratory system cancer. Moreover, nickel can cause a disorder known as nickel-eczema [1,2]. Nickel is an excellent alloying formed through the reaction of hydrazine on ketones or aldehydes [29-31].

Experimental Section

Materials and instruments

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Figure 4 show the absorption spectra of immobilized 1-acenaphthoquinone 1-thiosemicarbazone on hydrolyzed cellulose acetate which was obtained after equilibration at pH 6.0 containing different concentrations of Ni^{2+}. The spectral characteristic of this optical sensor indicate maxima at 337 nm. It is evident that the membrane absorbance at 337 nm decrease by increasing Ni^{2+} concentration as a result of the complex formation in the optode. During the titration, no measurable spectral shift was observed, which is typical for an absorption process involving a strong complex formation [26].

Effect of pH on the sensor response

The response characteristic of the prepared membrane sensor was highly dependent to pH. Since variation of pH changed the absorbance of both the free and complexed forms of the immobilized **L**, for the study of the effect of pH absorbance differences (ΔA) before and after addition of Ni^{2+} was followed in a pH range of 4 to 10. As shown in Figure 5, the change in absorbance increased rapidly by changing the pH from 4 to about 5.5, while it was decreased at pH values higher than 6.5. The diminished response at the low pH region may be explained by the extraction of H^+ from the test solution into the membrane, via protonation of the donor atoms of **L**, resulting in an expected change in the formation of a Ni^{2+}-**L** complex. On the other hand the reduced optical response of the proposed sensor due to a possible of Ni^{2+} hydrolysis in higher pH values. Thus, a pH of 6.0 was considered as optimum and used for further studies [33].

Calibration curve of the sensor

The dynamic working ranges for the proposed membrane sensor was studied by stepwise addition of Ni^{2+} to a series of test solutions followed by the absorbance difference monitoring at 337 nm. It was found that the absorbance decreased continuously by increasing the Ni(II) concentration and the membrane was saturated when the Ni^{2+} concentration exceeded 10^{-4} mol L^{-1}. Under the specified experimental conditions, the calibration curve in a logarithmic scale for Ni^{2+} was linear from 5.01×10^{-10} to 2.04×10^{-5}

38]. e mean absorbances of the membranes at 337 nm were found to be 0.801 (± 0.025) and 0.805 (± 0.020), before and a er this period,

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