شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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HANAA ALY

كليه العلوم -قسم الكيمياء

Evaluation of Some Material in Construction of Novel Potentiometric Electrodes

Thesis submitted in partial fulfillment of the degree of master in chemistry

Presented by

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B.Sc. (2016)
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كليه العلوم -قسم الكيمياء

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Osama Ali Saad Mohamed

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(Chemistry)

To

Department of Chemistry

Faculty of Science

2021

Ain Shams university

Head of Chemistry department

Prof. Dr. Ayman Ayoub Abdel-Shafi

Evaluation of Some Material in Construction of Novel Potentiometric Electrodes

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Osama Ali Saad

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Summary

Chapter one: This chapter includes a general introduction on potentiometry, the basic principles, theory, historical background, characteristics and classification of potentiometric as well as optical sensor. This chapter gives brief introduction about glass-ceramic and fabrication of reference electrodes, as well.

Chapter two: This chapter covers recycling of laboratory glass ware (Pyrex) through the preparation of a low thermal expansion and chemically durable borosilicate glass-ceramic (BsGC) using Kaolin and Pyrex. As well as preparation of nano-porous ceramic to avoid errors originated from screening effect of porous glass frit. Low thermal expansion and high chemical durability ceramics are advantageous in many applications such as lab supplies, corning ware, automobile components, and other low expansion products that are resistant to thermal shock. Kaolin and borosilicate were chosen for the preparation of glass-ceramic, because they have low thermal expansion and good chemical durability. BsGC was prepared by sintering borosilicate glass waste (e.g., Pyrex laboratory glassware, household glass) and kaolin at different temperatures (750-900 ° C). Water absorption method was used to measure the apparent porosity of the prepared composites. Surface morphology of the prepared BCGs was investigated using scanning electron microscopy (SEM). Phase composition of the prepared BGC samples was characterized sing X-ray diffraction technique (XRD). The XRD results showed that at sintering of 750 °C a monocrystalline quartz was only existing. By increasing sintering temperature up to 800°C the quartz phase decreased, while at 850 ^{o}C the quartz phase completely disappeared. The sintered BCG composites obtained exhibited low coefficients of thermal expansion in the range of 48 x 10^{-7} $^{o}C^{-1}$ and exhibited high chemical durability. Reference electrodes constructed with the developed nano-porous ceramic frits exhibited excellent performance characteristics in terms of flow rate (0.41 - 0.002 µL/h), potential drift (0.02 mV/hour), pH range (2-12), and impedance (680 Ω). Reference electrodes prepared with nano-porous ceramic materials exhibited low potential drift, wide pH range, absence of screening effect. Moreover, decreasing the pore size of the ceramic frits from the micro