Elaboration and characterization of iron hydroxide thins films prepared by Dip – Coating

H. Berkane, L. Chekour

Laboratoire «Microstructure et Défauts dans les Matériaux »,Université Frère Mentouri Constantine 1, Algérie.

Abstract

Theiron hydroxide β-FeOOHisamaterialwidely used invariousfields such asoptical, electronics and other. The object ofthis work is theoptimization of the parametersfor the development ofthin layers ofiron hydroxidesusing the methodofDip-Coating. This method, simpleimplementation, is based on thesoakingand removalof samplesin an appropriate solution. The drying step frees the residual solvent and the gel layer.

First, we observed that the crystallization of β-FeOOH layer is connected to the temperature co-precipitation. Also, tests were conducted for different temperature ranging from 20 to 40°C. The X-ray diffraction showed the crystallization of the β-FeOOH material starts at 25°C. The optimum temperature for best crystallization was found between 30 and 35°C. Sample analysis by SEM showed that the microstructure of the films is nanometric. The use of UV visible, infrared and Raman spectroscopic allowed us to watch the optical properties of prepared layers.

Keywords: Thin film, β-FeOOH, iron hydroxide, dip coating process, X-ray, morphology.

1-Introduction

The thin layers of iron hydroxides know for many years, industrial interest because of their special properties, and the aim this work is to obtain akaganeite (β-FeOOH) well crystallized film and understand the growth mechanisms of these films. To do this, we have made deposits thin layers of β- FeOOH by dip-coating.

2. Experimental

The base material used as precursor is hydrated iron chloride powder (FeCl3 6H2O), Hydrochloric acid HCl (0.01%), and ethanol (C2H5OH) was added as an additive. The solvent being ultrapure water

3. Results and discussion

The absorption edge shifted towards the higher wavelength [1] with increasing precipitation temperature Fig. 1. The SEM image Fig. 2 of the β-

FeOOH precursor that exhibits a regular spindle [2]. Fig. 3 presents the XRD patterns of the film. All the diffraction peaks can be well indexed to β-FeOOH phase [3].

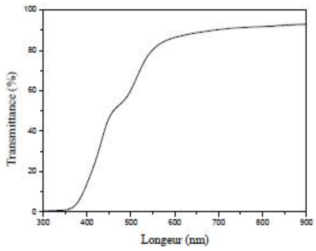

Fig. 1. UV-VIS spectra data of β-FeOOH

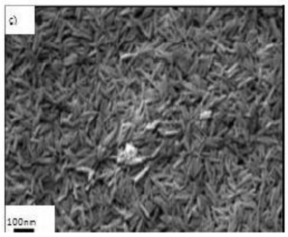

Fig. 1. SEM image of β-FeOOH

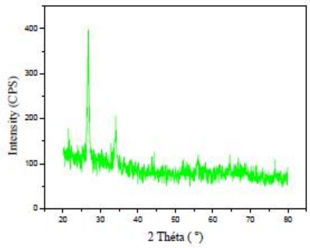

Fig. 3. XRD Patterns ofβ-FeOOH

4. Conclusions

In this paper, a facile and low-cost nature of the dip-coting method made and remove for the synthesis of β-FeOOH. Crystallization of β-FeOOH layers is coupled with temperatures of coprecipitation and annealing. The X-ray diffraction showed the crystallization of the β-FeOOH material starts at 20 ° C, and the optimum temperature of crystallization was found at about 30 °C. Samples are prepared under this temperature. Annealing samples show nanometric microstructure of films. X-ray diffraction reveals the progressive formation of the β-FeOOH phase as a function of the temperature of coprecipitation, and the formation of the oxide Fe2O3 during different annealing. The UV-Visible spectroscopy shows a radiation absorption shifted to the IR.

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