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PII: S2211-3797(17)31134-8
DOI: https://doi.org/10.1016/j.rinp.2017.12.048
Reference: RINP 1123

To appear in: *Results in Physics*

Received Date: 27 June 2017
Revised Date: 12 November 2017
Accepted Date: 17 December 2017

Please cite this article as: Messaadi, C., Ghrib, T., Ghrib, M., Al-Otaibi, A.L., Glid, M., Ezzaouia, H., Investigation of the percentage and the compacting pressure effect On the structural, optical and thermal properties of alumina-zeolite mixture., *Results in Physics* (2017), doi: https://doi.org/10.1016/j.rinp.2017.12.048

Investigation of the percentage and the compacting pressure effect On the structural, optical and thermal properties of alumina-zeolite mixture.

C. Messaadi[1, 3], T. Ghrib[2,*], M. Ghrib[1], A. L. Al-Otaibi[2], M. Glid[3], H. Ezzaouia[1]

[1]Laboratory of Semiconductor Nanostructures and Advanced Technologies, Research and Technologies Center of Energy, Borj Cedria, Tunisia.

[2]Department of physics, College of science of Dammam, Imam Abdulrahman Bin Faisal University, P. O. 383, Dammam 31113, Saudi Arabia.

[3]Science Faculty of Bizert, University of Carthage, Tunisia.

*** Corresponding author:** *taher.ghrib@yahoo.fr*

Abstract

This paper presents a detailed investigation of the correlation between micro-structural, optical and thermal properties of a mixture constituted of NaA zeolite and Al_2O_3 alumina with different portions at various compacting pressures. A comprehensive study was made by using SEM, EDX, XRD, PL and PTD analysis. Through this full characterization, it was demonstrated that a mixture of grain size ranging from 50 nm to 85 nm can be used as a red emitter of mean wave length $\lambda = 650$ µm in optical devices. This mixture also proved to be used as a thermoinsultor or a thermocondensor material; with a thermal conductivity of about 0.22-1.33 $W.m^{-1}.K^{-1}$ and a thermal diffusivity of about 0.070-0.174 $cm^2.s^{-1}$.

Keywords: NaA Zeolite, Alumina, Photoluminescence, Thermal properties

Introduction

Zeolites are microporous, alumino silicate minerals, consisting of three-dimensional arrangement of SiO_4 and Al_2O_3, linked by oxygen atoms that form different construction units and large frameworks. Having specific nanochannels, nanopores and ion-exchange capacity, zeolites can be used in various applications as molecular sieves, adsorbents, catalysts [1]. The synthesis of zeolites, has received significant attention in recent years. This is because they have a wide variety of starting materials containing high amounts of Si and Al, e.g., kaolin, high-silica bauxite, halloy site, interstratified illitesmectite, montmorillonite...etc. [2–9]. Zeolites were confined almost 200 years ago in mineralogical museums because of their beauty. The ability to synthesize with a controlled structure and size also proved to be useful in various applications ranging from the separation gas