الجمهورية الجزائرية الديمقراطية الشعبية
وزارة التعليم العالي والبحث العلمي
جامعة قسنطينة 1 – الإخوة منتوري
كليـــــــــة العلوم الد قيـقة

PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH
Constantine 1 University – Frères Mentouri
Faculty of Exact Sciences

ANNONCE DE SOUTENANCE DE THESE

Mlle **H A R R A T Safia**

Soutiendra sa thèse de **Doctorat Troisième Cycle** en Physique
Spécialité : «**Nano-matériaux, nano-objet et énergétique** ».

Intitulée : «Synthèse et caractérisation de composés intermétalliques nanostructurés pour le stockage et la conversion de l'hydrogène»

D a t e : le Dimanche 24 Novembre 2024 à 16H00.
L i e u : A la salle de conférences de la Biologie sise au Bloc des Sciences Université Constantine1 Frères Mentouri.

Devant le jury :

	Nom et prénoms	Grade	Etablissement d'appartenance
Président	BENSAHA Rabah	Professeur	Université Constantine 1 Frères Mentouri
Directeur de thèse	SAHLI Mounir	Professeur	Université Constantine 1 Frères Mentouri
Co-directeur de thèse	CHETEHOUNA Khaled	Professeur	INSA Centre Val de Loire, Campus de Bourges – France -
Examinateurs	OMARA Abdeslem	Professeur	Université Constantine 1 Frères Mentouri
	ABDELBAKI Noureddine	Professeur	Centre de développement des énergies renouvelables (CDER). Alger
	BOUHADDA Youcef	Directeur de recherche	Unité de recherche appliquée en énergies renouvelables (URAER), Ghardaia.

A b s t r a c t :

Hydrogen storage in a simple and efficient manner with an acceptable volume and weight for on-board applications remains a major challenge. Several scientific and technological barriers hinder the development of a viable solution. One of the promising approaches consists of developing new porous materials based on metals or alloys. These materials could exploit hydrogen adsorption and

absorption mechanisms to achieve higher storage capacities. Our major objective in this study is to synthesize and characterize new nanostructured intermetallic compounds based on Mg, Zn, and Co by a sonochemical route by varying the molar fractions of Mg and Co in order to evaluate their impact on the materials obtained. Physicochemical characterization was carried out to evaluate the structural, optical, and thermal properties of these samples. X-ray diffraction (XRD) confirmed the presence of different crystalline phases, such as MgO, ZnO, Co3O4, and the Mg-Zn binary phase. Raman spectroscopy and Fourier transform infrared spectroscop (FTIR) identified the vibrational modes and provided information about the functional groups and chemical bands present in the samples. The scanning electron microscope (SEM) revealed the octahedral morphology of the prepared materials with different average sizes. Photoluminescence (PL) spectroscopy analysis revealed green, blue, and ultraviolet emissions, with green emission being the most frequent. Finally, heat capacity and thermal diffusivity measurements were used to study the thermal properties of the samples. The second objective of this thesis was to evaluate the efficiency of hydrogen storage in the prepared materials. The obtained results reveal that the studied sample has a reasonable hydrogen storage efficiency, especially the prepared material containing a high mole fraction of cobalt (samples 3), with a storage capacity of 1.5 wt. %. The study results confirm that these materials can be used as potential candidates for solid hydrogen storage.