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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

كليـة العلـوم الدقيقـة

ANNONCE DE SOUTENANCE

Conformément à la décision n° **55/D3C/2026** du **11 Mai 2026** autorisant la soutenance d'une thèse de doctorat, le Vice-doyennat chargé de la post-graduation, de la recherche scientifique et des relations extérieures, a n n o n c e la soutenance publique d'une thèse de doctorat le :

Dimanche 14 Juin 2026 à 16 HOO

Lieu : Salle de conférences sise au Campus Chaab Erssas.

F i l i è r e : P H Y S I Q U E

Spécialité : Nanomatériaux nano-objets et énergétique.

Doctorante : NAMOUNE Djalila

Sur le thème : « Etude des couches minces nano-composites à base de TCO é l a b o r é e s par voie SOL-GEL ».

Devant le jury d'examen :

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Abstract

Within the framework of this research, two series of tin dioxide SnO_2 based thin films were prepared: the first series included undoped SnO_2 films and magnesium-doped SnO_2 films (SnO_2:Mg), while the second series included undoped SnO_2 films and aluminum-doped SnO_2 films (SnO_2:Al). All samples were deposited on glass substrates using the dip-coating technique, before being subjected to a series of physical analyses, including X-ray diffraction (XRD), Raman spectroscopy, FTIR spectroscopy, scanning electron microscopy (SEM) coupled with EDS (EDX), UV–Visible spectroscopy, photoluminescence (PL), and Hall Effect measurements.

XRD and Raman analyses showed that all the films exhibited a polycrystalline tetragonal rutile-type structure, with a preferential orientation along the (110) plane. The results obtained were in good agreement with the standard JCPDS data. UV–Vis measurements revealed a decrease in transmittance compared to pure SnO_2 films, ranging from 87% to 62% for SnO_2: Mg and from 93% to 66% for SnO_2: Al, accompanied by a slight narrowing of the band gap.

For both series of thin films (SnO_2: Mg and SnO_2: Al), the optical band gap energy decreases with doping. PL analysis confirmed the presence of defect levels, particularly oxygen vacancies (V_o), and showed that the emission intensity increases with dopant concentration. Hall effect analysis revealed the occurrence of a conductivity inversion from n-type to p-type when the mass concentration reached 9% for SnO_2: Mg and 7% for SnO_2: Al. SEM and AFM observations demonstrated that doping with Mg as well as Al induces a significant modification of the surface morphology together with an increase in surface roughness (RMS), which contributes to enhancing photocatalytic activity.

Finally, the photodegradation of methylene blue (MB) under UV irradiation was investigated using pure and Al-doped SnO_2 thin films. The results demonstrated that increasing Al concentration, particularly at 7%, significantly improves the degradation efficiency, confirming the beneficial role of doping on photocatalytic activity.