Presentation ABSTRACT

OPTICAL & PHOTONIC MATERIALSPRODUCTS

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MICROWAVE ACTIVATION OF SOL-GEL SPIN COATED MAGNESIUM DOPED GALLIUM NITRIDE THIN FILMS

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Abstract. In this paper, microwave (MW) activation of sol-gel spin coated magnesium (Mg) doped gallium nitride (GaN) thin films grown on sapphire (001) substrates were reported. The attention was paid to the effects of MW activation power on structural and optical properties of these *p*-type GaN films. X-ray diffraction results indicate that the Mg-doped GaN thin films exhibit hexagonal wurtzite structure with (002) preferential orientation. Besides, the Mg-doped GaN thin film activated at 450 W has the highest dislocation density, δ, implies that it has the largest amount of nitrogen vacancies compared to all the other samples, and consequently the poorest crystalline quality as proved by the drastic decrease in intensities of the XRD peaks of the film. Since nitrogen vacancies are favourably formed only upon the removal of hydrogen from *p*-type GaN, it can be deduced that the activation process of Mg dopants is most efficient at 450 W. Tensile strain along *c*-axis of the film activated at 450 W further validates this statement. Raman scattering measurements showed the presence of E_2(high) mode of hexagonal GaN in all the Mg-doped GaN thin films, except in film activated at MW power of 450 W where the E_2(high) mode peak is extremely weak and broad. The smallest crystallite size of the Mg-doped GaN thin film activated at MW power of 450 W leads to optical phonon confinement, resulting in broadening of E_2(high) mode. In summary, 450 W is the best power for the activation process of Mg dopant, but yet it is not the most ideal MW power because it deteriorates the crystalline quality of the films.

Keywords: Microwave activation, sol-gel, gallium nitride, spin coating, Mg-dopant.

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STRUCTURAL AND OPTICAL PROPERTIES OF [illegible] AND REDUCED GRAPHENE OXIDE

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Abstract. Natural intercalation of the [illegible] obtained as a product of Hummer's [illegible] sonication of water dispersed graphite [illegible] carried out to obtain graphene oxide (GO) [illegible] reduced graphene oxide (RGO).Here we [illegible] of metallic nitrate on the oxidation [illegible] graphite and then formation of metallic [illegible] composites with GO and RGO for the [illegible] observe a change in the efficiency of the [illegible] process as we replace the conventionally [illegible] nitrate with that of nickel nitrate $Ni(NO_3)_2$, [illegible] nitrate $Cd(NO_3)_2$ and zinc nitrate $Zn(NO_3)_2$. The [illegible] properties were investigated by X-ray [illegible] observed the successful formation of [illegible] GO and MO-RGO (M = Zn, Cd, Ni). We sought [illegible] the effect on the oxidation process through [illegible] characterization via UV-Vis spectroscopy and [illegible] Transform Infrared (FTIR) spectroscopy. [illegible] Thermo Gravimetric Analysis (TGA) analysis was [illegible] out to confirm>90% weight loss in each [illegible] proving the reliability of the oxidation cycles. We [illegible] found that the nature of the oxidation [illegible] graphite powder and its optical and [illegible] characteristics can be tuned by replacing the [illegible] nitrate ($NaNO_3$) by other metallic nitrates as [illegible] $Ni(NO_3)_2$ and $Zn(NO_3)_2$.On the basis of obtained [illegible] the synthesized GO and RGO may be [illegible] promising material in antibacterial activity and [illegible] electrodes fabrication for energy devices such as [illegible] cell, Fuel cell and super capacitors.

Keywords: Thermal properties of graphene [illegible] reduced graphene oxide, optical properties, [illegible] properties, fuel cell, composite materials.