

ELLIPSOMETRIC STUDY ON TiO₂ / ZnO BILAYER LAMINATE FILMS FOR PIEZOELECTRIC APPLICATIONS

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Nanolaminates are multicomponent systems made up of alternating layers of specific materials, each layer being of the nanometre order [1]. Mixing a wide variety of materials makes it possible to fine-tune a material in terms of the films properties, composition and structure [2]. The applications of hybrid films range from solar cells, sensors, piezoelectric MEMS, optoelectronic devices and protective coatings [3], to name only a few. Such suitable materials to be coupled together are zinc oxide (ZnO) and titanium dioxide (TiO₂) due to their close band gap energies, in the range of 3.2 – 3.4 eV [4,5]. Both materials are photocatalysts, ZnO presents a piezoelectric effect and it is interesting to consider how their functionalities will act in a laminate system.

In this work TiO₂ / ZnO bilayer laminate films were deposited on glass and Si (111) substrates by Atomic Layer Deposition (ALD) method, through the spacing and thickness of each layer has been carefully controlled, thus a various combination of TiO₂ and ZnO multilayers were produced. The films were measured by a Woollam™ Rotating Analyzer Ellipsometer and characterized by WVASE® software. We present the ellipsometric results obtained on these laminate films in terms of layer thickness, refractive index and band gap energies, highlighting the influence of composition and layer order on optical and piezoelectric properties.

Keywords: TiO₂ / ZnO laminate films, ALD, ellipsometry, optical /piezoelectric properties

References

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