Synthesis and Characterization of Al-Doped ZnO Thin Films by Sol-Gel Method

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ABSTRACT

In this study focus on sol-gel method, the adjustment of pH by adding inorganic aluminum salts, synthesis and stability of colloidal liquid coating. Deposition by spin-coating on the glass substrate, in the appropriate heating treatment , crystalline form of aluminum-doped zinc oxide films (ZnO: Al, AZO) , When the 3:1 ratio of zinc and citric acid, aluminum-doped to 2.25 when the volume of the AZO thin film synthesis, of AZO film was as low as 9.96×10-3 Ω?cm after annealing in Ar at 700oC and heat treatment with hydrogen at 700oC. Shows the XRD diffraction in the vicinity of 2θ = 34 ° with (002) crystal face of the preferred orientation, And non-metallic state of the crystallization of zinc or aluminum there, Visible region (400 ~ 800nm) transmittance of up to 88 ~ 93%, And the use of Hall effect show that mobility of 5.03cm2/Vs and carrier concentration of 1.25 × 1020cm-3, AZO motor show, the carrier concentration, mobility and resistivity changes between the ion scattering by impurities and grain boundary scattering to explain.

This sol-gel coating solution can be carried out under room temperature operation, as compared to conventional vacuum film-forming systems, more economical process to reduce the cost of the use of special solvents. This study focused on the process parameters, including the synthesis of system pH, heat treatment temperature and atmosphere conditions on the AZO thin films, such as electrical and optical properties of the impact.

Heat treatment, the only access to the formation of a small amount of hydrogen can be better transmittance of the thin film, optical energy gap with the carrier to upgrade and increase concentration, this is the phenomenon of Burstein-Moss effect, showed an increase after the aluminum-doped sub-set of the occupied conduction band at the bottom of the original ZnO caused by the effect.

Keywords : Aluminum-doped zinc oxide (AZO)、sol - gel method (sol-gel)、nano-thin film、after、pH

Table of Contents

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