ABSTRACT

The Dysprosium oxide film Dy_2O_3 was deposited on p-type Silicon substrate by electron beam deposition under ultra-vacuum. The morphological characterizations are investigated by a scanning electron microscopy (SEM) and atomic force microscopy (AFM). Then the electric properties of the MOS structure Al/Dy_2O_3/p-Si are studied through current- voltage I (V), capacitance– voltage C (V), conductance- frequency dependencies G (f). The total conductance curves for the sample are found to obey Jonscher power law ($\sigma(\omega) = \sigma_{dc} + A\omega^n$) with an increase of frequency exponent (n) as temperature increases. The impedance studies reveal the presence of temperature dependent dielectric relaxation. Likewise, the analysis of the temperature variation of the imaginary part of modulus (M") spectra confirms the existence of relaxation phenomena. The electrical modulus studies show that the relaxation is associated with grain boundaries effects. Nyquist representation (Z" vs. Z') was plotted and their characteristic behavior was analyzed in terms of electrical equivalent circuit. It can be concluded that the Dy_2O_3 shows promising dielectric and insulating behavior for the application in future microelectronics technology.