Abstract

Titanium dioxide TiO_2 films were prepared from Titanium Isopropoxide ($C_{12}H_{28}O_4Ti$) and the deposited by spin coating method on silicon, glass and ITO coated glass substrates.

After the process of deposition that including the prepared samples in the programmed oven has finished, the temperature raises at heating rate 1˚C/min from room temperature (R.T), to settle up to final degree. Half an hour later, the temperature starts to decrease each minute so as to reach the room temperature (R.T) in order to arrive at the Antase phase.

X-ray diffraction (XRD), scanning electron microscope (SEM), and energy dispersive x-ray (EDX) are used for the structural analysis and the surface morphology of the film has been studied by atomic force microscopy (AFM).

X-ray diffraction (XRD) patterns confirm that polycrystalline TiO_2 anatase phase formation. The intensity of XRD peaks increases with the increase in heat treatment and better crystallinity takes place at higher temperature. From the morphology images, it can be seen that the films deposited at 250 ˚C appears to be less uniformed than the morphology of the sample deposited at (350-650) ˚C.

Throughout examining the samples by Scanning Electron Microscope (SEM), and Energy Dispersive X-ray analysis (EDX) on the prepared samples, it has to be matched with what is previously prepared.

The morphology of deposited films are characterized by atomic force microscope (AFM), with increasing heat treatment, both the particle size and surface roughness have increased .The particle size value has been 2.184, 2.374, 4.834, 5.125, and 8.336 nm and RMS roughness values have been 0.161, 0.223, 0.552, 0.810 and 1.494 nm for the films deposited at 250, 350, 450, 550 and 650 $^{\circ}$C, respectively.

UV and visible spectra have been recorded as a function of wavelength in the range (320-900 nm) in order to study the optical properties such as reflectance, Energy gap of allowed and forbidden direct transitions, extinction coefficient, refractive index, and dielectric constant in real and imaginary parts as a function of photon energy. It has been found that all the investigated parameters are affected by heat treatment temperature. The optical band gap of the films has been found to be in the range 3.4-3.69 eV for the forbidden direct electronic transition and 3.6-3.89 eV for the allowed direct transition within different heat treatment.

As for the electronic application, characterization of Solar Cell under the effect of the light equivalent to that of the sun radiation and which fall vertically on the sample were studied. (I-V) characteristics show that the best results can be achieved in temperature 550 ˚C.