# Abstract

Iraqi economy depends mainly on oil production (about 90% of it). The production, storage and transportation is accompanied by leakage and emission range of hazardous and toxic gases.

In this thesis, a gas detector has been built using Si (n-type) and glass substrates, with deposition of various oxides (a thin film of ZnO, $Zn_2SnO_4$, $ZnSnO_3$, $SnO_2$) by certain ratios (0, 25, 50, 75 and100)% of zinc chloride and tin chloride salts solved in water. The spraying process was done by a spraying technique at a temperature of (500 ±5) °C for substrates. A system was also built for the preparation of some oxidizing and reducing gases such as ($CH_4$, LPG, $H_2S$, $NO_2$, $SO_2$ and $CO_2$) to measure and compare the sensitivity and response time of samples for gases.

Scanning Electron Microscopy (SEM) was employed to study the surface morphology of the samples. X-Ray Diffraction (XRD) measurements were also performed to obtain the structural information of the samples. The XRD results showed that the ZnO, $SnO_2$, $Zn_2SnO_3$ and $ZnSnO_3$ layers grew on different substrates. The surface morphologies of the ZnO, $SnO_2$, $Zn_2SnO_3$ and $ZnSnO_3$ thin films indicated the formation a homogenous surfaces when these films are deposited on n-type Si and glass. The Ultraviolet-Visible absorption spectra (UV) showed band gap for the samples were comparable with reported values.

After the samples were exposed to different gases to measure the sensitivity and response time, it was found that all structures changed the values of sensitivity and response time with the gas concentration, and with less time. The highest response for all compositions was to ( $SO_2$- gas) and less responsive was to LPG gas. The best value of sensitivity was (100%) for the mixture ($ZnSnO_3$ + $Zn_2SnO_3$) to $SO_2$ gas at a concentration (1000 ppm) which precipitated on Si substrate.