

# [As based on the adsorption of the gas](https://assignbuster.com/as-based-on-the-adsorption-of-the-gas/)

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As environmentalregulation become more stringent, the need to develop highly sensitive gassensor grows. To meet the demand of low level gas detection, gas sensors shouldbe upgraded in sensitivity , selectivity, and speed of response 1. At the sametime they should be cost effective and reliable over long term2. Metal oxidesemiconductor sensors based on electric conductivity measurement have been usedextensively for gas detection . SnO2 is most widely used materialamong semi-conductor oxide for making sensors due to its low cost, long lifeand good reproducibility 3, 4 , thick film SnO2 device are moststudies and most candidate due to their high level of sensitivity , simpledesign, low weight and cost effectiveness. SnO2 is an n –type , wide–band gap (3. 6 Ev) semiconductor 5. Its electrical conductivity id due to thenon-stoichiometric compositions as a result of oxygen deficiency 6.

Thesensing properties of the thick film gas sensor are based on the adsorption ofthe gas molecules on it surface which produce changes in their conductivity7. When exposed to air, freshly prepared tin-oxide particles adsorbed on theparticle adsorb oxygen atoms on the surface 8. These oxygen atoms pick up thee-s  from the conduction bandof tin oxide and are adsorbed on the particle surface as O- ions. Each tin oxide particle is covered with negativity charged O-  ions on the surface. On the other hand, due to depletion e-s , there exits a layer of positively chargeddonor atoms just below the particle surface. The  O- adsorbents react with the gases and release the  e-s   to the conduction band at higher temperature, when reducing gases came in contact with sensor. Consequently, the depth of the space –charge layer decreases, which result’s in a decrease in the height of the potential barrierfor  the electronic conduction at  the grain boundaries. The concept of ANNanalysis have been discovered nearly 50 years ago, but in handing the practicalproblem it is used only from last 2 –decades9.

ANN are collections of smallindividually interconnected processing units. Information is passed between these units along interconnections. An incoming connection has two value associated with it, an input value and aweight. The output of the unit is a function of the summed value. Once an ANNis trained for a prescribed data it may be ready to be used then for theprediction or classification ANNs can automatically learn to recognize patternin the data real system or from physical models, or other sources. An ANN canhandle many input and produce answer that are in a from suitable for designers 10. Artificial Neural Network(ANN) model may be used as alternative method for technological analysis andmatlab based calculation.

Artificial Neural Networks have two main components-the processing element called neurons and the connection between them, eachconnection have their own weights. The neurons are the information processorsand the connection functions are the information storage. Each processingelement first calculates a weighted sum of the input signals and then appliesthe transfer functions .

The term ‘ Feed Propagation’ comes due to the trainingmethod used during the training process-back propagation of error. A GradientDescent Backpropagation with adaptive learning rate algorithm is used to adjustthe weights in the hidden and output layer nodes. The result is a network thatproduces the mapping between the input values and output values with help ofthe neurons. In this model perception, Feed-Forward Propagation is one ofsuitable method of artificial neural network, designed for the testing andtraining of data. Three training methodologies based upon forward propagationwas used.

Purelin, logsin and tansin network transfer function for all theneurons, which reflects the relationship between concentration as input andsensitivity for different concentration as output of SnO2 based 1%Pd-doped thick film gas sensor. Sensitivity is tested by artificial neuralnetwork. In neural network architecture one layer acts as input layer, tenneurons acts as the hidden layer and other layer output layer. In this modelinput is concentration of methanol and output is the sensitivity of sensor. Though in present work single sensor is exposed to single gas or vapor at atime and ANN is utilized to confirm it with experiments so that the datacollected can be used to train the network when sensor is replaced by sensorarray and single gas is replaced by group of gases or vapors to achieve highselectivity. This model was trained to generate a mapping between the inputconcentration of the methanol and output as the sensitivity of themethanol. Sensitivity is dimension less quantity which is obvious from itsexpression In the present work for reorganization of the sensitivity of the 1 %Pd-doped SnO2 sensor feed forward network has been used. A FeedForward network can be used for the reorganization the pattern of the system.

Feed Forward network uses the Gaussian activation function. The importance ofsuch function is that it is non negative for all value of x.