HAZARDOUS GAS DETECTION AND ALERT SYSTEM USING PIC MICROCONTROLLER

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ABSTRACT

Safety plays a serious role in today's world and it's necessary that sensible safety systems are to be implemented in places of education and work. This work modifies the prevailing safety model put in in Industries and this technique even be utilized in homes and offices. The most objective of the work is coming up with Microcontroller primarily based gas police work and alerting system. The unsafe gases like LPG, carbon oxide, H2S, Resistive were detected and showed every and each second within the liquid crystal display. If these gases exceed the traditional level then associate degree buzzer alarm is generated straight off. The zigbee module communicates data from the module to the PC/LAPTOP.

Keywords: MQ6 Sensor, MQ7 Sensor, H2S Sensor, Chemiresistor sensor.

INTRODUCTION

The increase within the development of technology and therefore the humankind, we have a tendency to did not pay attention concerning the surroundings during which we have a tendency to board. So we have a tendency to contaminate the surroundings and thereby reducing the standard of the place we have a tendency to live. although there are many aspects of pollution like soil, air and pollution, out of those pollution acts because the serious facet because the different will detected visually and by style, however the contaminated air can't be detected because it may be odorless, tasteless and colorless. Therefore there's a growing demand for the environmental pollution watching and management systems. Within the read of the ever-increasing pollution sources with harmful chemicals, these systems ought to have the facilities to observe and quantify the sources speedily.

These gases have to be compelled to be monitored; such increase within the traditional level of them may well be best-known and correct precaution measures is taken. However the present systems obtainable aren't therefore moveable and are expensive and troublesome to implement. Therefore AN embedded system is meant victimization PIC 16F877 Microcontroller, for the aim of detection of risky gas run, that successively avoids the endangering of human lives. Inexpensive gas-sensors have attracted plenty of interest throughout the last decade to be used in numerous applications [1], like

food internal control victimization active packaging materials, numerous national defense and anti-terrorist applications, air quality watching in mines, etc. Among the gases of interest, H2S could be a outstanding example [8]. H2S could be a terribly toxic and ignitable gas. It's typically generated as a byproduct of various industrial processes or by the degradation of organic matter within the absence of element by microorganism. Inhalation of 500-1000 ppm of H2S for thirty min will cause loss of consciousness or maybe death due to metabolic process dysfunction or asphyxiation [9].

According to National Institute of activity Safety and Health, the H2S concentration instantly dangerous to life or health is a hundred ppm, and also the counseled exposure limit is ten ppm for a most length of ten min [10]. H2S incorporates a characteristic smell of rotten egg. However, due to temporary dysfunction of all manufactory nerves at higher concentrations quite a hundred ppm, the smelling capability is severely compromised. Indeed, H2S is additionally generated throughout decomposition of many food stocks, as well as eggs, and low-cost H2S sensors are so additionally of interest for the food and packaging trade. Metal compound sensors (mox) are used as gas sensors in many applications: environmental observance, food and nutrient internal control, home safety and automation applications, and so on. The analysis works during this field subsume rising the sensitivity, the property, the steadiness, and also the repeatability of such devices by exploring new materials and new

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fabrication techniques, like nanowires. The aim of this work is to style a cheap and versatile interface for resistive sensors, giving each wide operative vary and quick readout characteristics.

LITERATURE REVIEW

In the year of 2008, LIU zhen-ya, WANG Zhen-dong and bird genus Rong, "Intelligent Residential Security Alarm and device System supported Single Chip Computer", the paper focuses on, Intelligent residential stealer alarm, emergency alarm, fire alarm, harmful gas outpouring remote automatic sound alarm and device system, that is predicated on 89c51 single chip pc. The system will perform associate degree automatic alarm that calls the police hotline variety mechanically. It may also be a voice alarm and shows alarm occurred address. This intelligent security system is used management the power remotely through phone [8].

In the year of 2008, subgenus Chen Peijiang and Jiang Xuehhua, "Design and implementation of Remote watching System supported GSM", this paper focuses on the wireless watching system, as a result of the wireless remote watching system has a lot of and a lot of application, a far off watching system supported SMS through GSM. Supported the general design of the system, the hardware and software system design of the system is meant. During this system, the remote signal is transmitted through GSM network. The system includes 2 components that area unit the watching center and also the remote watching station. The watching center consists of a laptop and a TC35 communication module for GSM. The pc and also the TC35 area unit connected by RS232. The remote watching station include a TC35 communication module for GSM, a MSP430F149 MCU, a show unit, sensors and a knowledge gathering and process unit. The software system for the watching center and also the remote watching station were designed using VB [7].

In the year of 2006, Ioan Lita, particle Bogdan Cioc and Daniel Alexandru Visan, "A New Approach of Automatic Localization System exploitation GPS and GSM/GPRS Transmission", this paper focuses on, a coffee price automotive localization system exploitation GPS and GSM-SMS services, that provides the position of the vehicle on the driver's or owner's movable as a brief message (SMS) on his request. The system is interconnected with the automobile device that alerts the owner, on his movable, concerning the events that happens together with his automobile once it's lay. The system consists by a GPS receiver, a microcontroller and a GSM phone. In further the system is settled for feat and transmission the knowledge, whenever requested concerning automobile standing and alerts the user concerning the vehicle started engine.

The system are often used as a coffee price answer for automobile position localizing similarly as in automobile following system application [16]. within the year of 2002, K. Galatsis, W. Wlodarsla, K. Kalantar-Zadeh and A. Trinchi, "Investigation of gas sensors for vehicle cabin air quality monitoring", this paper focuses on, automobile cabin air quality observance are often effectively analyzed mistreatment metal chemical compound conductive (MOS) gas sensors. During this paper, commercially out there gas sensors ar compared with fancied Moo3 based mostly sensors possessed comparable gas sensing properties. The detector has response seventy four higher relative to the hest industrial detector tested [21]. Within the year 2000, K. Galatsis, W. Woldarsla, Y.X. Li and K. Kalantar-zadeh, "A Vehicle air quality monitor mistreatment gas sensors for improved safety", this paper focuses on a vehicle cabin air quality monitor using monoxide (CO) and gas (02) gas sensors has been designed, developed and on-road tested. The continual observance of gas and monoxide provides intercalary vehicle safety as alarms might be go away once dangerous gas concentrations are reached, preventing driver fatigue, drowsiness, and exhaust gas suicides. CO concentrations of 30ppm and gas levels below nineteen.5% were intimate with while driving.

IMPLEMENTATION

The gas levels area unit perceived through the several gas sensors (here MQ-2 and MQ-7 area unit used for sensing LPG and gas severally for demonstration purpose) and sent to the PIC small controller. The perceived analog signals area unit born-again to digital through ADC (inbuilt just in case of PIC). The perceived gas levels area unit displayed within the LCD; if anyone gas level exceeds the point then AN alarm is generated in real time. At an equivalent time associate alert message is shipped as SMS to the licensed user through the GSM electronic equipment. The diagram of the planned system is shown in figure3.

GAS SENSORS

Normally a gas detector is that the one that is created from electrical device that senses the gas molecules. It sends electrical signals because the output that is proportional to the gas concentration. The gas sensors don't sense a selected gas, therefore they need to tend to use analytical techniques to adopt to spot a selected gas. But these analytical ways suffer from several disadvantages of delicate operator, specially designed PC's and slows time interval etc., and therefore the projected system doesn't suffer such disadvantages. The projected system is an automatic one, however it needs to reset once each vital state of affairs.

LPG SENSOR

It is a perfect sensing element to discover the presence of a dangerous LPG leak in our home or during a station, tank setting and even in vehicle that uses LPG gas as its fuel. This unit is simply incorporated into associate alarm circuit/unit, to sound associate alarm or give a visible indication of the LPG concentration. The sensing element has glorious sensitivity combined with a fast reaction time. Once the target flammable gas exist, the sensor's conduction is higher at the side of the gas concentration rising. A straightforward electronic circuit is employed to convert modification of conduction to its corresponding output of gas concentration. MQ-6 gas sensing element shown in figure four is employed to sense the toxic gas and has high sensitivity to LPG, and conjointly response to gas. It's a transportable gas detector that has long life with low price. LPG)
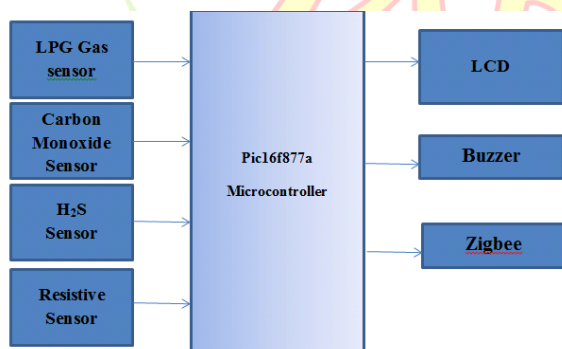
**RESISTIVE COMPONENT ESTIMATION**

The planned system adopts associate degree estimation methodology that's the mix of a resistance-to-time conversion (RTC) associate degreed an interpolation formula supported the smallest amount mean sq. (LMS) line [17], [18]. As shown in Fig. 1, it's essentially composed by associate degree measuring device In that generates associate degree signal Vo betting on this Is flowing through the detector. Once the switch SWc is within the higher position, the detector excitation voltage Vs is that the constant and positive voltage Vexc, leading to the output voltage Vo to be a falling ramp. The slope α of Vo is expounded to the detector resistance Rs in step with (1). The switch SWR is employed to prevent the mixing method by forcing Vo to zero once closed; once open, the measuring device works commonly, therefore SWR is additionally used as a trigger for beginning associate degree estimation cycle

$$|α| = Vexc /RsC.$$

The estimation of α is performed by at the same time victimization 2 completely different ways. The primary one, within the following referred to as RTC, takes advantage from the measuring of the time intervals that the ramp needs to cross 2 completely different threshold values: Vth−l and Vth−h. 2 comparators and 2 counters enforced within the Digital block area unit used for this purpose. As shown in Fig. 2, a mensuration cycle consists by a reset section (determined by the switch SWR) with length Tres, and by the ramp itself, H2S detector Sulphide may be a colorless gas that's usually characterized by its rotten egg like odor and incorporates a LEL, or Lower Explosive Limit, of 4.0 percent. it's burnable and intensely unsafe. Sulphide gas is taken into account a broad-spectrum poison and H2S gas detectors area unit necessary in areas like, however not restricted to, the oil and gas industries wherever drilling or processing would possibly happen, waste water treatment plants, sewer and sanitation areas, and even giant farming facilities wherever exposure to animal waste is high Resistive detector.

A chemiresistor could be a material that changes its resistance in response to changes within the close chemical surroundings.[1] Chemiresistors are a category of chemical sensors depends on the direct chemical interaction between the sensing material and therefore the analyst. [2] The chemical interaction between the sensing material and therefore the analyst will vary from a valence interaction, to atomic number 1 bonding interactions, to form recognition. Many totally different materials have chemiresistor properties: metal compound semiconductors, some semiconducting polymers,[3] and nanomaterials like graphene, carbon nanotubes and nanoparticles. Generally these materials are used

as partly selective sensors in devices like electronic tongues or electronic noses.
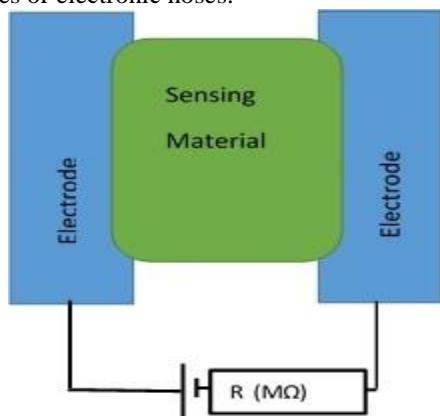
A basic schematic of one gap chemiresistive detector. A basic chemiresistor consists of a sensing material that bridges the gap between 2 electrodes or coats a group of interdigitated electrodes. The resistance between the electrodes is simply measured. The sensing material has associate degree inherent resistance that may be modulated by the presence or absence of the analyst. Throughout exposure, analytes act with the sensing material. These interactions cause changes within the resistance reading. In some chemiresistors the resistance changes merely indicate the presence of analyst. In alternative chemiresistors, the resistance changes are proportional to the quantity of analyst gift. This permits for the quantity of analyst gift to be measured.

RESULT AND DISCUSSION

Some prototypes are developed to through an experiment verify the results obtained by simulations. A low-power 8-bit microcontroller (PIC18LF452) with a 10-bit data converter was wont to at the same time management 2 sensors. The heater is supercharged by sanctioning a bipolar semiconductor device, whereas the sensing element resistance is measured with reference to a reference electrical device (10 kΩ). Four consecutive 14-ms heating pulses square measure applied to the sensors each two min.
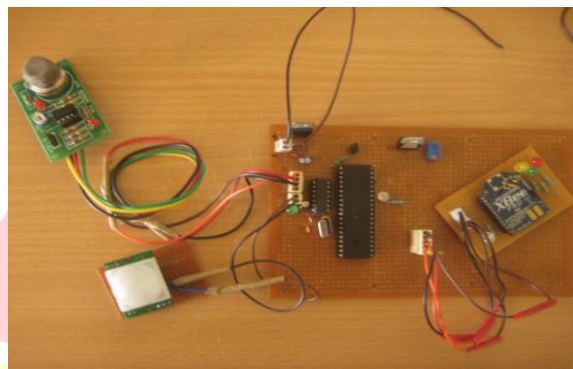
Experimental tests with 2 experimental MOX sensors are reported within the following. The primary take a look at considers a gold/ton alloy MOX device, operated from Vh = zero.2 V (Ph ≈ forty mW that corresponds to concerning sixty five °C) to Vh = three.2 V (Ph ≈ 540 mW that corresponds to concerning 430 °C). Fig. seven shows the non-inheritable device transient (a detail of the region at the start of the experiment and, within the inset, the complete acquisition). The device resistance Rs features a drop of 3 decades, ranging from concerning two hundred money supply and decreasing to concerning two hundred Mount Godwin Austen in a very measure of five s. At the start of the transient the device resistance Rs features a non-regular behavior, attributable to the actual fact that the device heater voltage Vh is varied manually and so the modification isn't fast.

After Vh has stabilized to its final price, the device behavior becomes additional regular, following a decreasing graphical record. As visible in Fig. 7, the system has been able to finely track Rs , therefore permitting an in depth analysis of the device behavior to be performed. The second take a look at considers a titanic oxide MOX device, operated from Vh = a pair of V (Ph ≈ two hundred mW that corresponds to concerning 215 °C) to Vh = four V (Ph ≈ 560 mW that corresponds to concerning 440 °C). Fig. eight shows the non-heritable device transient (a detail of the region at the start of the experiment and, within the inset, the total acquisition). The device resistance Rs incorporates a drop of just about 3 decades, ranging from concerning one gig cycle and decreasing to concerning a pair of M1 in an exceedingly measure of fifteen s. As within the previous case, because of manual modification of the heater voltage Vh, the device resistance Rs incorporates a non-regular behavior at the terribly starting of the transient. As

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visible in Fig. 8, the system has been another time able to accurately follow Rs, even in presence of high resistance values and fast resistance variation, therefore confirming the effectiveness of the planned resolution.

CONCLUSION

In summary, the gas sensing method is powerfully associated with the surface reactions. Completely different metal oxide based mostly materials have completely different reaction activation to the target gases. Composite metal oxides sometimes show higher gas response than the one part if the chemical change actions of the elements complement one another. Metal additives with high-effective reaction chemical change activity may be accustomed enhance the sensitivity of pure metal oxides as a result of the "spillover effect". Moreover, smart catalyst supporting materials are a key purpose to see what proportion potential of catalysts may be developed. So, the structure of metal chemical compound layers is extremely vital. High surface areas are necessary to get highly-dispersed catalyst particles. Moreover, high surface spaces will give giant reaction contact area between gas sensing materials and target gases. Porous structure with high surface areas appears to be the quality structure of metal chemical compound gas device layers. It assembled by many tiny grains with voids and pores among them. It's conjointly showed that tiny grain size is helpful to reinforce the sensitivity. At high temperatures, tiny grains tend to agglomerate into giant entities, decreasing each surface areas and chemical change properties of the fabric.

It is vital to stay balance between decreasing grain sizes and stability. Another vital structure issue is crystallographic sides. One-dimension materials area unit prospective material platform for successive generation of sturdy conduct metric gas sensors thanks to open surface, high gas sensitivity and long-run stability, etc. Besides the inner causes of metal oxides mention higher than, the external causes, like temperature and wetness, conjointly play a very important role within the testing of sensitivity. Wetness can decrease the sensitivity and be harmful to repeatability. Luckily, it is eliminated by heating to high temperatures (usually > 400 °C).

Reference

[1] R. Al-Ali, Member, IEEE, Imran Zualkernan, and FadiAloul, Senior Member, IEEE, "A Mobile GPRS-sensors array for Air Pollution Monitoring" vol.6, pp.410-422, Oct.2010.

[2] NihalKularatna, Senior Member, IEEE, and B. H. Sudantha, Member, IEEE "An Environment Air Pollution Monitoring System Based on the IEEE1451 Standard for Low Cost Requirements" IEEE Sensors J., Vol. 8, pp.415-422, Apr. 2008.

[3] M. Abu Jayyab, S. Al Ahdab, M. Taji, Z. Al Hamdani, F. Aloul, "Pollumap: Air Pollution mapper for cities", in Proc. IEEE Innovations in Information Technology Conf., Dubai, UAE, Nov.2006, pp.1-5.

[4] A. Sieber, P. Enoksson, and A. Krozer, "Smart electrochemical oxygen sensor for personal protective equipment," IEEE Sensors J., vol. 12, no. 6, pp. 1846–1852, Jun. 2012. D. Tobjörk and R. Österbacka, "Paper electronics," Adv. Mater., vol. 23, pp. 1935–1961, Mar. 2011.

[5] M. Schweizer-Berberich, M. Zdralek, U. Weimar, W. Gopel, T. Viard, D. Martinez, A. Seube, and A. Peyre-Lavigne, "Pulsed mode operation and artificial neural network evaluation for improving the CO selectivity of SnO2 gas sensors," Sens. Actuators B, Chem., vol. 65, no. 1–3, pp. 91– 93, Jun. 2000

[6] S. Bicelli, A. Depari, G. Faglia, A. Flammini, A. Fort, M. Mugnaini, A. Ponzoni, and V. Vignoli, "Model and experimental characterization of dynamic behaviour of low power carbon monoxide MOX sensors with pulsed temperature profile," in Proc. Instrum. Meas. Technol. Conf., 2008, pp. 1413–1418.

[7] Depari, A. Flammini, D. Marioli, E. Sisinni, E. Comini, and A. Ponzoni, "A 10 ms-readout interface for the characterization of highvalue wide-range experimental resistive sensors," Sens. Actuators B, Chem., vol. 146, no. 2, pp. 495–501, Apr. 2010.

[8] H. Bai and G. Shi, "Review gas sensors based on conducting polymers," Sensors, vol. 7, no. 3, pp. 267–307, 2007.

BIBLIOGRAPHY

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