iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** IX **Month of publication:** September 2020

DOI: https://doi.org/10.22214/ijraset.2020.31691

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue IX Sep 2020- Available at www.ijraset.com

Internet of Things (IoT) Solution for the Health Consequences caused by Cremation in Modern India

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Abstract: ***The greater significance of crematoria is the health implications. The pollutants generated by Corpse cremation are increasingly worrisome issues in the current society. Eventually there are few studies seeking to generate solutions to provide healthy lives as these emissions include heavy toxics. Inhalation of cremation gases causes difficulty in breathing, respiratory infections and damages internal parts of the human body. The main areas that have been highlighted in this study are cremation gases, its consequences on living bodies and sensing devices. Sensors are responsible for detecting highly toxics that are being emitted during cremation into the air. Hence, a sensory device is required to determine the pollutants to get rid of them. Author in this paper uses Mq-135 and No2-B43F sensors to detect gases like carbon monoxide, ammonia, sulfur dioxide, nitrogen dioxide etc.***

Keywords**:** ***Cremation, Internet of Things, gases, carbon monoxide, sulfur dioxide, nitrogen dioxide, sensors.***

I. INTRODUCTION

Thousands of years ago, people not only cremated the dead but also buried them. In fact, India, emphasized cremation as best practice for decomposition of body in which 99.9% of Hindu's dispose of the dead. However, there is still, a minority of Hindu's in south India, who practice burial. Corpse cremation is one of the major causes of environmental pollution. Cremation is the process of burning of the dead body at high temperature that burns natural gases. During cremation natural gas burns at high temperature and produces highly toxics. One Corpse, cremation produces 534.6 pounds of carbon dioxide. During Corpse cremation many particulates and chemicals are released into the atmosphere includes, carbon monoxide, ammonia, nitrogen dioxide, mercury, sulfur dioxide, and volatile organic compounds (VOCs).

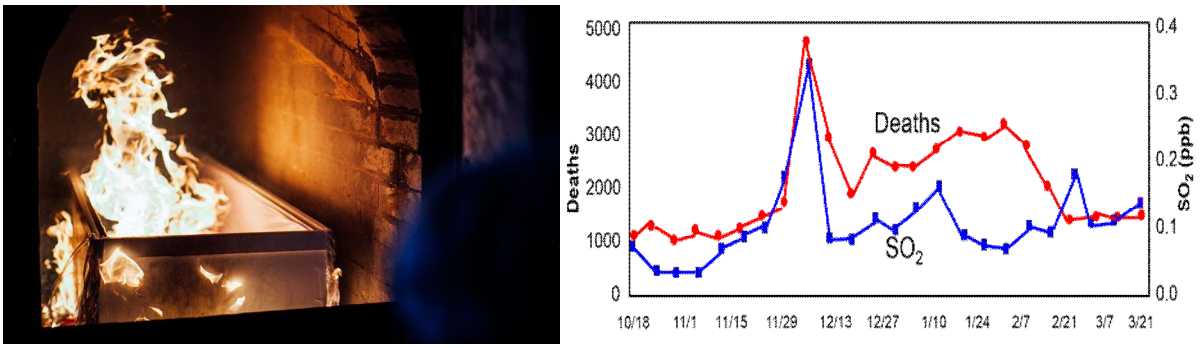

Fig. 1: Cremation and Increase in the amounts of SO_2 released with increase in deaths (cremation) which is very harmful to the livelihood

These pollutants cause severe health problems to the people who inhaled and also pollute the environment simultaneously. Especially hospitals nearby crematorium cause hazard health problems to the patients. Some of the gases like sulfur dioxide and nitrogen dioxide cause immediate heavy breathing, cough and respiratory problems that depend on the concentration of the gases inhaled by the people. The highly toxic gas, mercury affect, lungs and kidneys. In order to protect ourselves from cremated pollution it is very important to get awareness on harmful gases. How can we identify such pollutants? Sensors are the devices which has an ability to sense the data and in turn respond to the changes in the environment.

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Gas sensors like MQ-135, NO2B43F, MQ-3 etc, in the market are available to detect the specific gases. MQ-135 sensor has an ability to detect more than one harmful gas in the environment. Many gas sensors can only detect the gases but cannot measure the concentration or the level of the each gas released into the air.

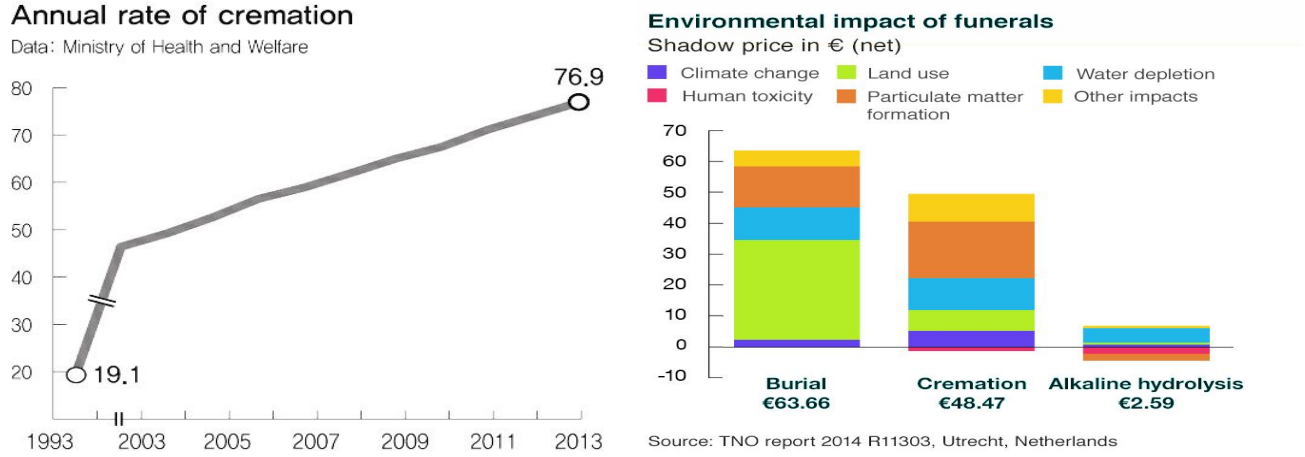

Fig. 2: Annual rate of cremation and Environmental Impacts of funerals (cremation)

II. POLLUTANTS

The pollution generated from crematories occurs continuously and silently and at the beginning of the 21st century, it is treated as one of the traditional sources of environmental contamination. Usually, corpses are cremated using natural gas and electricity. This process reduces the body into dust and ashes through intense heat resulting in decomposition, as the body is composed of 25 % solid and 75% liquidity. Thus liquid amounts are evaporated and the dust remains, as arisen from the solid parts. Due to the spread and growth of cremation practice, the crematories must be regulated to protect from health implications. Cremation practice emits carbon monoxide in large concentration. Cremation using fossil gas under heat releases carbon monoxide (800% to 6800 tones) sulfur dioxide, nitrogen dioxide (489% to 10,148 tones), ammonium, dioxides including particulate matter every year.

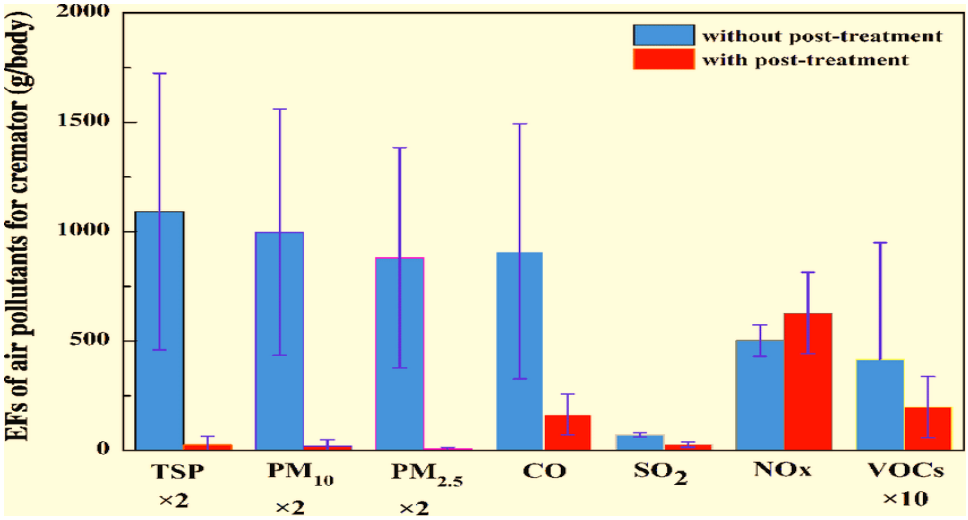

Fig. 3 Emission of Gases during cremation process

The organic chemicals such as benzene, methane, ethane and acetone are also emitted during cremation. The Lighter compound, benzene which releases in less amount combines with hydrogen chloride, hydrogen fluoride and furnace, produces polychlorinated dibenzodioxins (PCDDS) and polychlorinated dibenzodioxins (PCDDS). The figure shows the graphical representation of harmful gases released during the cremation. It clearly gives us an idea, what concentration of gases released into the environment. PM2.5, tiny particulate when released, occupies much longer time whereas PM10 produces in large amounts and are less effective than PM2.5. Carbon monoxide produces under incomplete combustion and displaces oxygen in blood. Nitrogen dioxide produces, in an average aggregate every year and causes more effects.

III.HARM TO HEALTH

Cremation gases not only pollute the environment, also potentially cause deleterious effects on living bodies while adverse health outcomes depend on the dose, exposure, duration of exposure and other factors. Crematories pollutants, increases risk for a wide range of diseases including respiratory infections, and heart problems further cause deaths. Mercury, a highly toxic, results in nervous, immune system, lungs and kidney damages when inhaled. These health consequences depend on the level of gas in taken by the body. When Mercury is inhaled, some amount of gas is observed through lungs and result in kidney failure. Nitrogen dioxide (No2) causes respiratory problems when inhaled. In case of additional develop asthma as it is easily observed through lungs, reduces its function and damages heart.

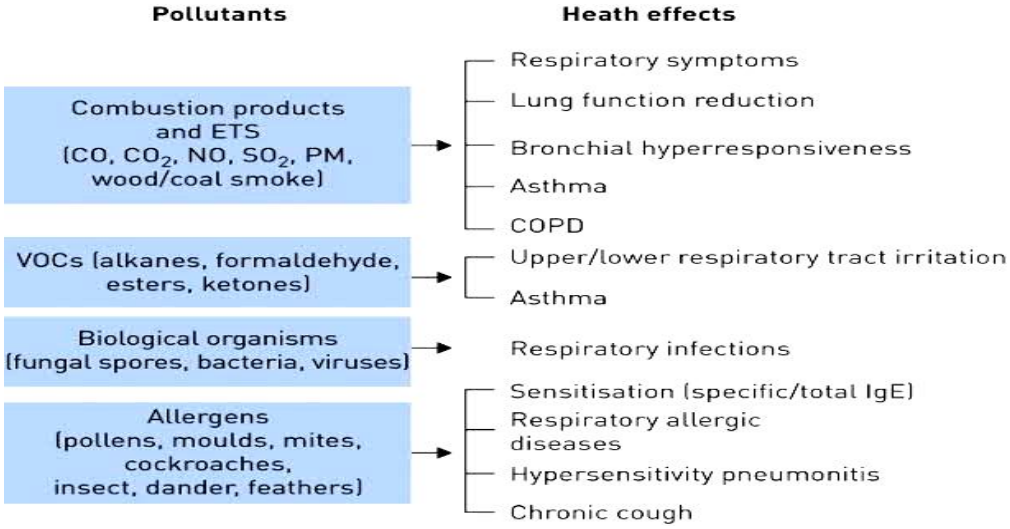

Fig. 4 Pollutants and health effects of that pollutants

When Carbon monoxide (CO) is inhaled it requires 6-8 min to emit the half of the inhaled CO in their blood. CO results in headache, vision problems and shortness of breath immediately even though the inhaled amount is less. Inhalation of ammonium does not support respiration, throat infections and lungs effect. Especially it is highly dangerous to eyes in case of excess amount. Sulfur dioxide is an irritant of the respiratory system as it penetrates deep in the lung, inducing coughing, respiratory diseases, wheezing, and even causes pulmonary edema when inhaled at high concentration. It seems that concentrations about 0.2PPM produce these adverse effects in humans. Particulate matter, PM2.5 stands on sixth highest threat factor for death around world. It mainly causes cancer, heart attacks and respiratory diseases. Asthma admissions associated significantly with 3 indicators of nitrogen dioxide exposure (mean concentration, summer mean and percentage days with NO2 levels greater than 35ppb). VOCs cause irritation to the nose, eyes, headaches, liver kidney and central system damages. Some VOCs are known human carcinogens.

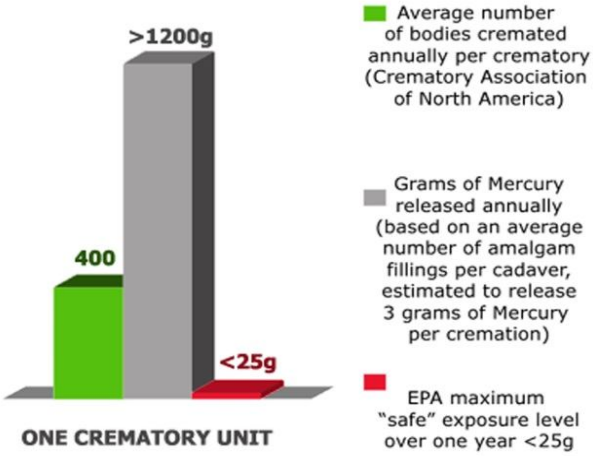

Fig. 5 Increase in the amounts of Mercury released per cremation which is very harmful to the livelihood

IV. SENSING DEVICES

A. MQ-135

Nanotechnology, a new technology, was implemented on gas sensors since, 1970s. In this technology, Nanomaterials are fabricated on each sensor and each nano materials (gas-
Sensing materials) show properties like sensitivity, selectivity and time. It was clearly
observed that the gases like carbon monoxide, sulfur dioxide, nitrogen dioxide and ammonia, potential in causing the wide range of health hazards.

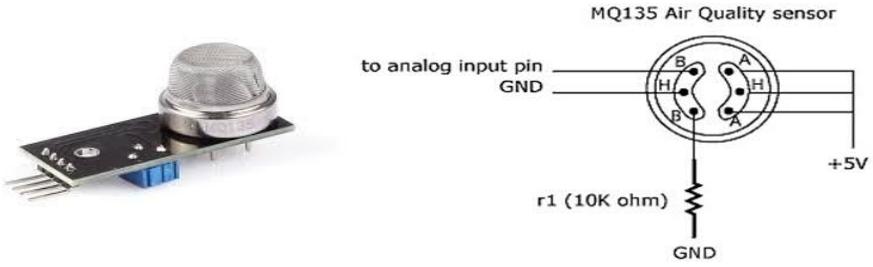

FIGURE 6: MQ135 Sensor

Sensor, MQ-135 used to detect or measure ammonia, smoke, benzene and sulfur dioxide According to the pin configuration, it has 4 pins which are analog pin (A0), digital pin (D0), ground (GND) and voltage pin (VCC). It operates between 0-5v voltages. The conductivity property in this sensor activates at -10°c to 50°c lower temperature. Sno2 contains higher resistance which is applied on MQ-135 as a sensing material in the air. The sensor resistance decreases as concentration of pollutants released increases. Analog pin is a TTL driven that works at 5v. Sensors can be used in both analog and digital, in case of monitoring, analog pin is preferable as analog values represent the concentration of gases. It detects the particular gases based upon their ranges like ammonium (10-300ppm), sulfur dioxide (10-1000ppm) and benzene (5-200ppm).

B. NO2- B43F

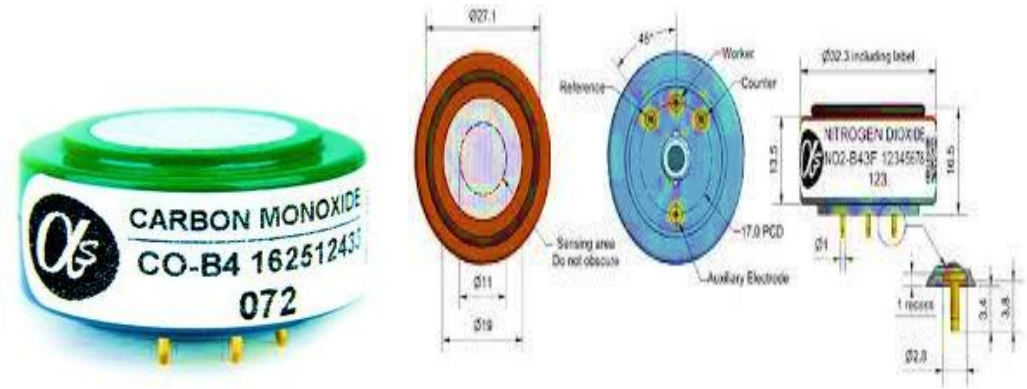

Fig. 7 Structure of NO2-B43F

No2 -B43F sensor is designed to determine the level of nitrogen dioxide (20 to 200 ppb) in the atmosphere. Sensor is designed in such a way that operates based on proven fuel cellular technology. It shows ultra high sensitivity to NO2. Sensor is activated during temperature range: -30°c to 40°c. ISB circuits are used in order to avoid disturbance and reduce noise to 15ppm with the opportunity of digital smoothing to reduce noise even further. These sensors are temperature dependent. Gas –sensing materials on chips predict the gases with respect to the resistance of the sensor. Senor with resistance 33ohms shows excellent resolution.

V. CONCLUSIONS

After completing this paper we can conclude that most countries practice cremation resulting gaseous pollutants, namely CO, NO2, SO2, NH3 particulate matter etc. They generally cause health problems and may lead to death in case of excess. Using mq135 and No2 sensors we can detect the harmful gases and reduce these emissions to some extent. Therefore, developing countries should be aware of the harmful effects of these gaseous pollutants and try to lower them.

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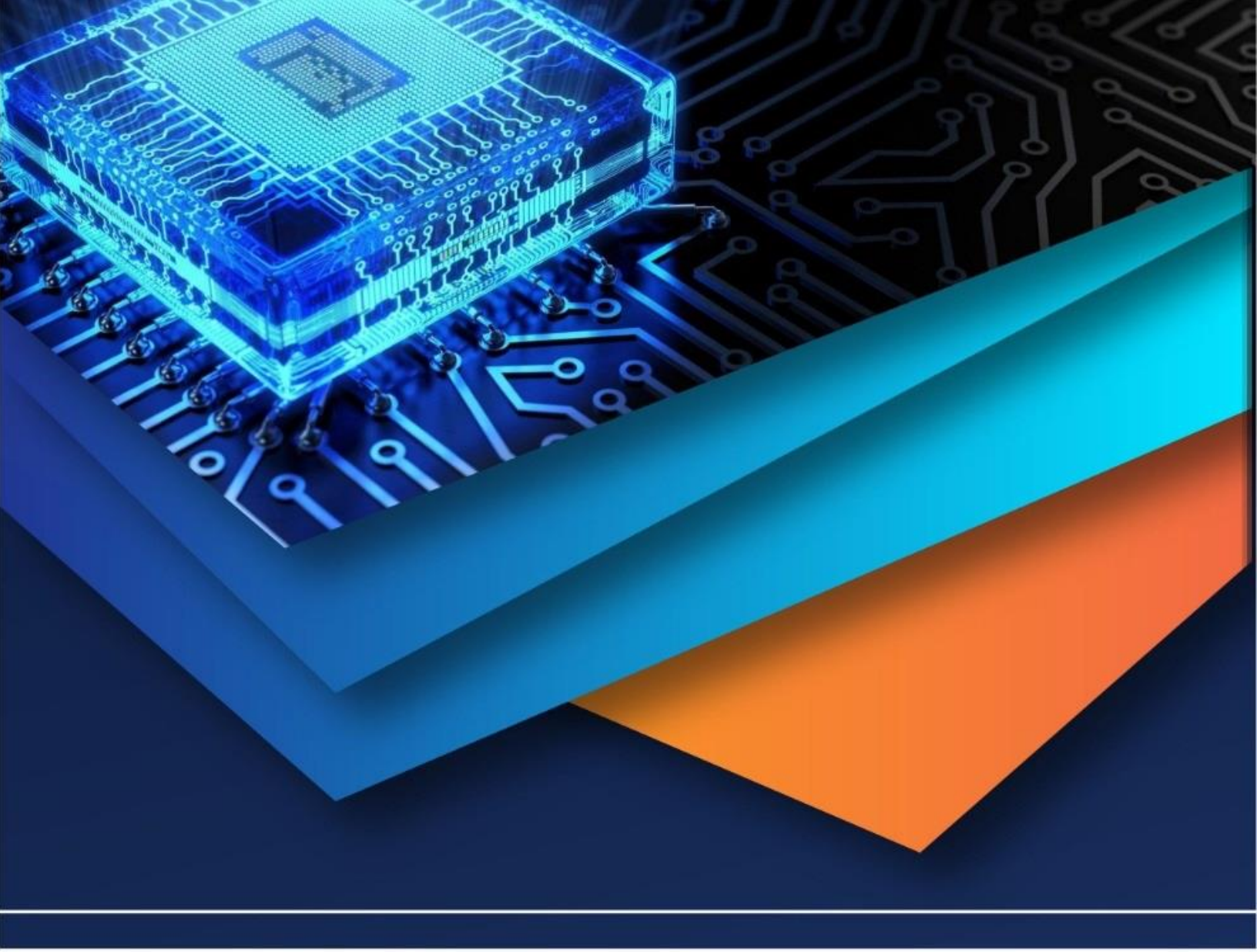

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