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# Designing and Constructing Nano Filter for Absorption the Pollutants Exhaust from Tractor Diesel Motors

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**Abstract:** Exhaust gases from car motors, is one of the main air polluter in the world. Recently, researches have been done which have main influence on decreasing the diffusion of exhaust pollutants. Among the pollutants, Hydro Carbone, Nitrogen oxides, Carbone dioxide and particles in suspension, (ingredient) hanging particles make up a large proportion. These particles can adsorb the pollutant of diesel exhaust. Therefore, Nano filter was made which four main parts and it can adsorb physically and chemically in a favorite way. This tool was installed on the exit point of exhaust, and compared with other catalysts; it had higher percent of adsorption. Considering the characteristics of this Nano filter tool, it can adsorb many incombustible and the other pollutants. After making Nano filter and economical assessment and compared with others adsorbents, we came to the, it is a better catalyst. The filter, which performs more physical absorption properties is more than any other site. physical adsorption is because of the pores in the Nano filter lead to trap harmful and poisonous substances.

**Keywords:** Nano Filter, Absorption Feasibility Study, Diesel Motor

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## 1. Introduction

As we know, today humankind is faced with problems of human suffering. One of the problems of diseases that result from inhaling toxic gases from the engine function [3]. This paper is based on nano filtration efforts be made to attract more than other filters that manufacturing methods and assessment in the following states

- (1) Supplying the grout of primary materials.
- (2) Grout costing for making ceramic Nano filter,
- (3) Aging Nano filter before complete draught,
- (4) Desiccation and baking of Nano filter (zeniter),
- (5) To determine density of Nano filter balk.

In a study chemical pollution emissions from heavy-duty diesel vehicles equipped with a diesel particulate filter (DPF) and selective catalytic reduction (SCR) was evaluated. [1] In the investigation properties and strategies to reduce air pollution by emissions in diesel engines nanoparticles were studied. The study tested the 100 level and using software the process of reducing air pollution in diesel engines using carbon nanoparticles were investigated. [7] The effects of particulate

matter in diesel fuel and its effects on engine performance and environmental pollution were examined. The result of this research indicate that particulate matter in diesel fuel can be engine performance, have negative effects [4].

## 2. Main Material

(1) SiO<sub>2</sub>

*Additives*

Balkly, Sodium, Silicate

*Characteristic and content of main materials*

SiO<sub>2</sub> Amorph

SiO<sub>2</sub> is mainly made of quartz or quarter it. The net quartz cannot be found in nature, but there is with gross. Its temperature is 1723 and generally it has 93 to 98 percent of SiO<sub>2</sub>. It has three forms: quartz, three diminat and cristobilite

*The characteristic and content of main materials additives*

*Balkly*

Balky is secondary clay and generally composes 1/3 of the clay complex (integration). Each clay is composed by small chain formed by links between materials like kaolinite, kildienite and mika [6]. The main content of balkly mineral is

kaolinite with the following formula:  $(Ca_{0.5\%}-Fe_{0.1}^{+3}-Mg_{0.1}-Al_{1/8})-SiO_5-OH_4$

The balky in this project is Mota and its chemical composition is shown in the table 1.

Table 1. Balky chemical composition.

Chemical composition	SiO <sub>2</sub> (SiO <sub>2</sub> )	Na <sub>2</sub> O (Na <sub>2</sub> O)	Fe <sub>2</sub> O <sub>3</sub> (Fe <sub>2</sub> O <sub>3</sub> )	MgO (MgO)	CaO (CaO)	TiO <sub>2</sub> (TiO <sub>2</sub> )	Al <sub>2</sub> O <sub>3</sub> (Al <sub>2</sub> O <sub>3</sub> )	K <sub>2</sub> O	Loi (??)
Percent	59	0.3	2.2	5	1	6	40	1.5	10.5

In the table 1, Loi is used balky weight decreased because of heating.

(2) Sodium silicate

Sodium silicate (Na<sub>2</sub>SiO<sub>3</sub>) is used to liquid in grout and it prevent clotting of the grout

(3) Titanium oxide (TiO<sub>2</sub>)

The below figure shows this material belongs to photocatalyst and is found in crystalized forms. Titanium oxide TiO<sub>2</sub> using is based on special characteristic of this material, like antibacterial and photocatalysis. [5] This material is used on outer port of buildings and roads, especially where is heavy traffic or very polluted. the use of this covering can decreasing the damages of pollution and specially the of Co, CO<sub>2</sub> and Nox.

The main affective factor of this function is from its intelligent materials.

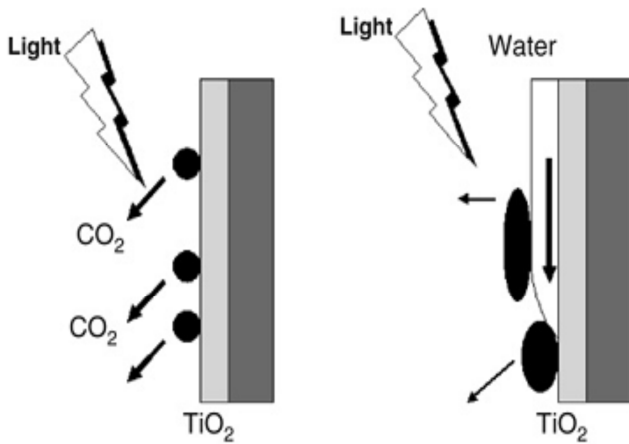


Figure 1. Titanium Oxide replacing and Hydrophile process.

(4) Aluminum Oxide (Al<sub>2</sub>O<sub>3</sub>)

This material is used to increase flexibility, malleation and more resistance against to corrosion in balkly solution. [2]

(5) Potassium oxide (K<sub>2</sub>O)

This material in grout causes backbone in produced pieces.

(6) Magnesium oxide and calcium oxide (Cao-Mgo)

This material is added to balky solution to increase the building of particles of one or several materials to be adhered so that to become a solid mass.

(7) Sponge

The kind of sponge used in this project is foam with density of 1/3 cm<sup>3</sup>. Foam is used to adsorb slurry.

### 3. Method

#### Nano filter making method

To supply the slush (white wash or grout), at first sill is

and micronized balky is entered the mixer.

The entered materials including Silica (2.39, 4 kg), Bayender (1.07 kg) and Deflocollant) in mixer were mixed for 2 minutes and water was also added to it slowly. Sodium silicate (0.1%) was also added to this mixer to pour and protect the slush. After two minutes the prepared slush is poured in a depository and it was be aged for one week. The balky of this slush was opened and was in an invariable form and linked to micro Sillis. During this time a little sodium silicate was added to slash to pour it and prevent from closing.

(1) Slush casting to make ceramic Nano filter and dehydrate stages

In this step, the prepared sponge dropped in slush, and absorbed sponge will be in the form of cylinder and the used sponge will be burned and destroyed. The pore of it will be remained in Nano filter and finally we will have a cylinder with pore and in size of Nano. The heating steps are as follows:

1. 24 hrs. in 50°C
2. 24 hrs. in 100°C

Then the samples were taken out of blotting pad and were placed into the furnace. In table 2, these steps are shown.

Table 2. Different temperature used for roasting Nano filter.

Time (hr)	Temperate rang 1	Temperate rang 2	Temperate rang 3
3	110	110	110
3	290	290	290
0.5	290	290	290
3	470	470	470
0.5	470	470	470
3	570	570	570
1	570	570	570
3	870	870	870
0.5	870	870	870
3	1050	1050	1050
4	1050	1050	1050
4	900	900	900
0.5	900	900	900

In the table 3 is referred to diagram and we can say that the baking curve is invariable until 870°C and after this temperature the range is 1050, 1170 and 1250 and there are three separate baking samples. Samples are prepared in the library; but test, pressure, are prepared invariable and resistance. These three samples were tested and it was signified that the best baking temperature is 1170°C. This temperature was optimum.

Furthermore, there are some other characteristics like, pore distribution, shock acceptance disconnection, resistance to crack.. It was specified that at 1170°C all the mentioned characteristics were optimum. Some of these characteristics

are defined in the relevant chapter and are shown in the table 3.

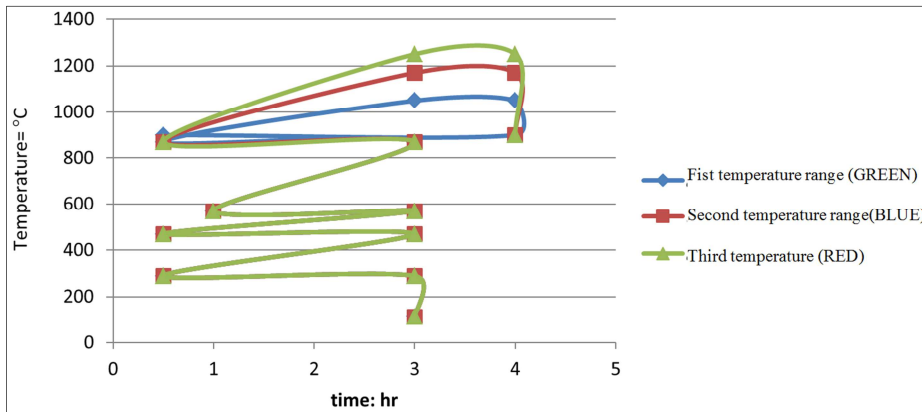


Figure 2. Nano filter changes process range.

(2) Ageing ceramic Nano filter before dehydrate

In this step, the filters are taken out of slurry (grout) and putted in a nylon bag which has small holes (the holes are for passing weather. This step can age the samples and slowly precipitates them to making ceramic filter stronger.

Twelve filters, which are measured before and after baking and dehydrating are in table 3. The variety selected dimensions of sponges is because of possibility of dimension changes after baking.

Table 3. Different size of prepared sponge.

Samples	1	2	3	4	5	6	7	8	9	10	11	12
Diatom, (mm)	35	35	35	45	45	45	55	55	55	65	65	65
Height (mm)	35	45	55	35	45	55	35	45	55	35	45	55

### 4. Results and Discussion

Pollution test of Dioxide Carbone Carbone monoxide, incombustible hydrocarbon and oxygen is the test of carbon dioxide measurement in different situations.

Table 4. Connected data of carbon dioxide gas base on gallons per minute.

Used duration	Percent of the Gas in unused Nano filter situation	The value of the Gas in used situation (ppm)
1-500ppm	1.9	97
2-1500ppm	1.32	75
3-2000ppm	1.52	98
4-2500ppm	2.1	111

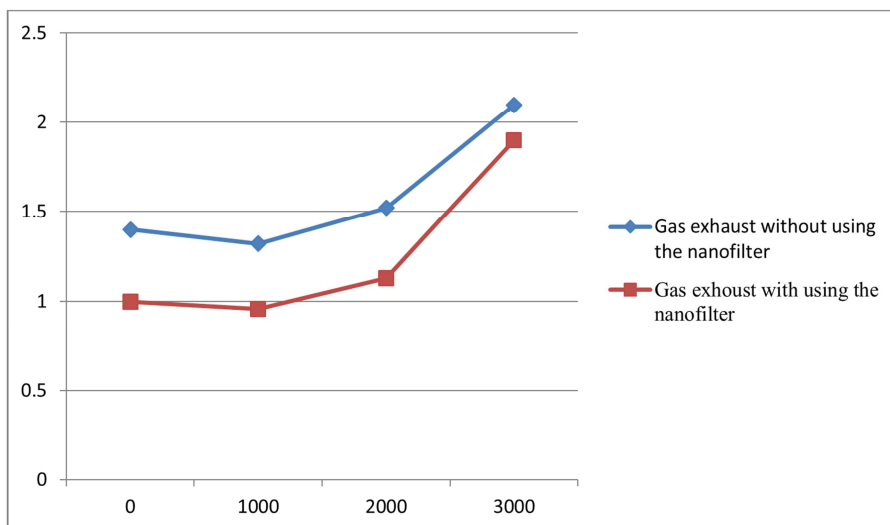


Figure 3. Test measurement of utilized carbon dioxide in used of Nano filter and in unused of Nano filter.

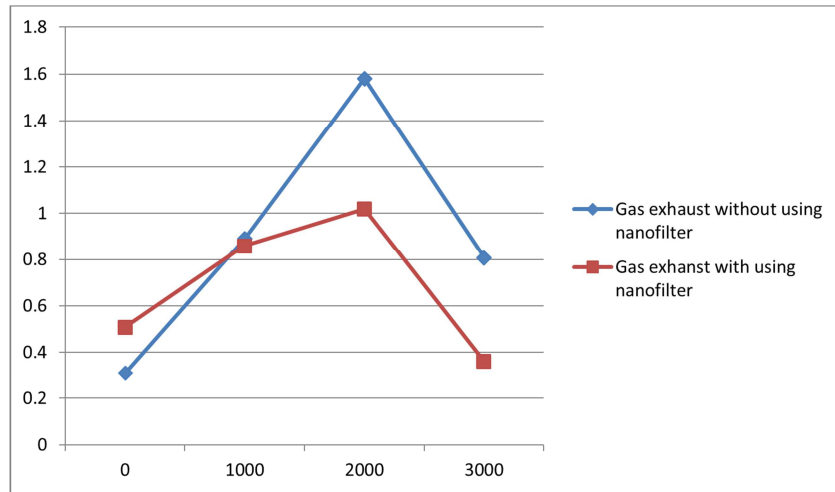


Figure 4. Measurement test of incombustible hydrocarbon Gas in utilized and in unutilized of Nano filter.

*O<sub>2</sub> molecule measurement test in different ppm*

Air emission, is resulting from operation of the diesel engine.

Table 5. Connected data with O<sub>2</sub>.

Ppm	Percent of the Gas in utilized position	Percent of the Gas in unutilized position
1-500ppm	18.5	11.5
2-1500ppm	18.53	17.53
3-2000ppm	13.31	16.52
4-2500ppm	16.6	14.01

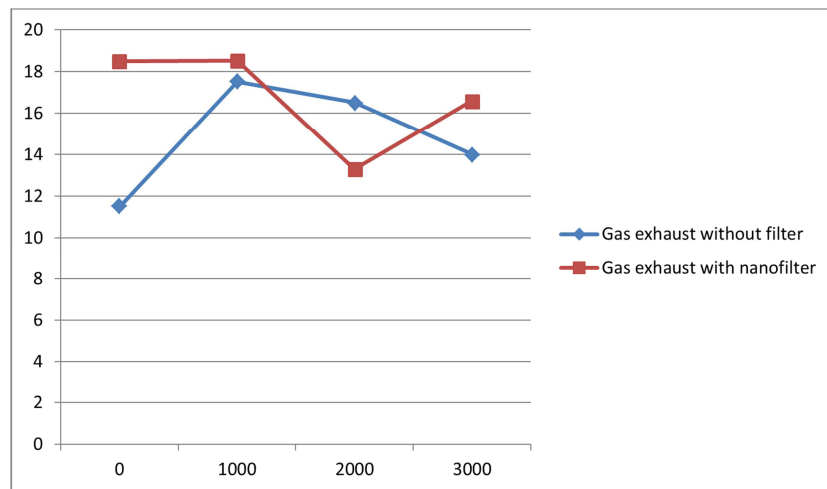


Figure 5. Oxygen Gas measurement test with filter and without filter.

Nano filter placement increased engine performance, so it is important installation.

After putting in the Nano-filter, engine emissions should be evaluated by measuring device, the device has the following characteristics. Contamination of engine performance test referred to in the heavy machinery and heavy-duty test was conducted emissions measurement devices from Austria AVL DiCom4000 with the ability to measure NO<sub>x</sub>, CO, CH, CO<sub>2</sub>, λ, opacity and other parameters such as distance, angle spraying, and retards the advance-be CO and CO<sub>2</sub> gases in the infrared non-broad cast system, AVL DiCom4000 chemical method using paramagnetic and NO<sub>x</sub> measurement and measurement of pollutants is worth

noting that, before the test are Calibrated precision test facility is shown in the following picture

### 5. Conclusion

- 1). Regarding the diagrams of pollutant adsorption assay like incombustible hydrocarbons, Carbone Dioxide, monoxide Carbone and oxygen, we can say that Nano filter, compared to others, can absorb from 8 to 9 percent ppm more pollutants.
- 2). After making Nano filter and economical assessment and compared with a there absorbents, we came to the result that making Nano filter has 15 to 20 percent

economic advantages and regarding the utilized materials and their changes, it is a better catalyst.

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