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Emission Control in Automobiles

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Abstract: ***Looking at upcoming emission legislations for automobiles and with environmental issues such as global warming, the demand for engine exhaust gas emission reduction is necessary. The regulation demands the need for eco-friendly vehicle. In order to reduce the emission several technologies are being studied. The emissions which are produced in exhaust is Hydro-carbons, Carbon gases and Oxides of Nitrogen are severely harmful to humans like causing lung diseases, nose strain problem even leads to lung cancer. The aim of the present study is to reduce the Nox and produce low cost emission control method. The ceramic filter has the ability to deliver low emission even with fine particles of micro- metre size even at elevated temperature. Potassium permanganate, Urea in certain ratio is mixed and coated on ceramic filter acts as an oxidising agent which reduces the formation of HC and CO. Ammonia acts as a buffer, absorbing particulates and reduces the product surge pressure. Aluminium foil paper rolled on the ceramic filter to reduce the temperature of the exhaust. Since the emission control has chemicals which are priced less when compared with catalytic converter the installation cost is and improves the economy of engine.***

1. INTRODUCTION

Before beginning to understand emission controls you should know the reason why emission controls were installed into the automobile. To reduce the amount of pollution entering into atmosphere. They include Hydrocarbons (HC), Carbon monoxide (CO), Oxides of Nitrogen (Nox)exhaust gases: Hydrocarbons are produced because of incomplete fuel combustion or fuel evaporation. Hydrocarbons emission is considered a hazardous form of air pollution because of. eye, throat, lung irritation, and possibility of cancer. Carbon monoxide emissions are exhaust emission that is the result of partially burned fuel(high carbon monoxide emission can be caused by restricted or dirty air cleaner, advance ignition timing, Clogged fuel injectors. The same factors that increases NOx will tend to improve fuel mileage and lower HC and CO2 production. This means that to increase fuel economy and lower HC and CO2 production NOx will increase. For this reason emission controls have been added to lower all form of emissions. Particulates: are solid particle of carbon soot and fuel additives that blow out the tail pipe. Engine crank case blow by Caused by heating of oil and unburned fuel vapours that blow past the engine rings. The aim of the paper is to reduce the emission by using potassium permanganate, Urea, ammonia and Camphor are the good oxidizing agents. These oxidizing agents should be provided with ceramic exhaust filter inside, so it cools the exhaust gases as it can easily identify and kills dangerous reactants.

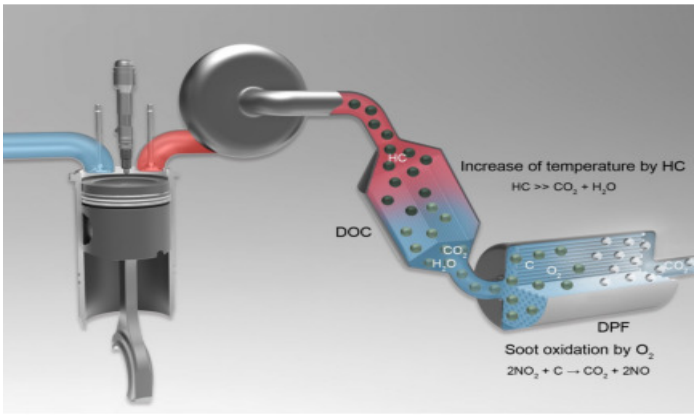


Fig. 1 Exhaust System [1]

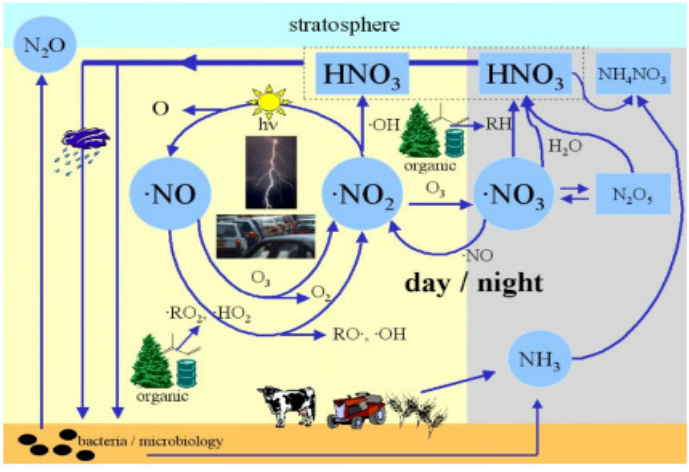


Fig. 2 Gives an overview of the role of nitrogen oxides in atmospheric chemistry [9]

2. CERAMIC EXHAUST FILTER

An improved, efficient, and regenerable exhaust emission filter and filter system are provided which incorporate the use

of an inorganic, non-woven fibre filter element. The filter is able to capture exhaust pollutants and particulates through the interwoven nature of the filter element and due to area enhancements applied to the filter element including microscopic enhancements. The filter has an improved life and is able to combust a greater percentage of trapped particulates due to the high temperatures the filter element can withstand. The filter element if formed from a non-woven fibre block which is machined or shaped into a filter foundation. The filter element can have a multitude of coatings and catalysts applied and can be wrapped in insulation and a casing. The improved exhaust emission filter is particularly useful for diesel engine exhausts.

3. SUBSTRATE

Substrates are honeycomb-like structures with thousands of parallel channels. The walls of these channels provide the surface for precious-metal catalysts that convert noxious emissions into carbon dioxide, nitrogen and water vapour. Honeycomb-like structure with thousands of parallel channels forces exhaust gases into the turbulent flow regime resulting in better contact between emission and precious metal, enhanced mass-transfer conditions, and higher conversion efficiency. The ceramic filter has been chosen as the substrate for the following reasons are High surface area, Low pressure drop, Rapid light-off, Thermal-mechanical durability, System cost efficiency, Easy availability in market, Available in different shapes and sizes, Economical, Easy utilization

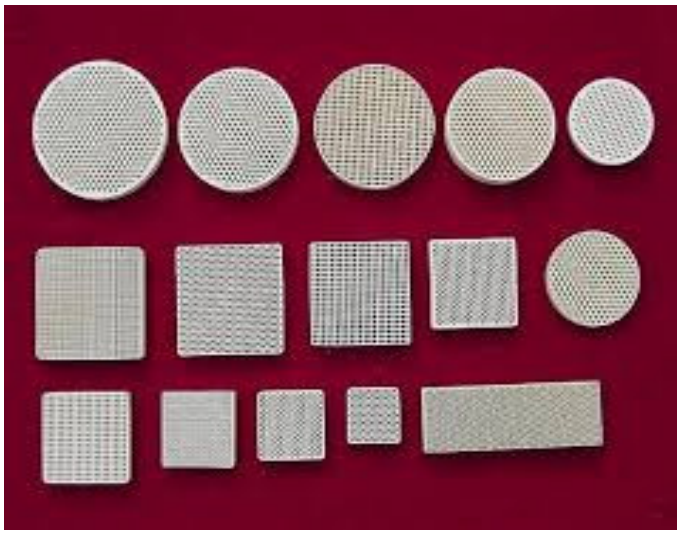


Fig. 2 Ceramic Exhaust Filters

4. FABRICATION OF EXHAUST FILTER

The oxidising agents such as potassium permanganate, urea and camphor are mixed together to form a paste. The ceramic filter is dipped in the paste. Then the coated ceramic filter is filed with aluminium foil paper and small vent holes on made on the foil allowing the exhaust gases to pass through it.

Fig. 3 Components

Fig. 4 ceramic filter is dipped into the paste

Fig. 5 ceramic filter filed with aluminium foil

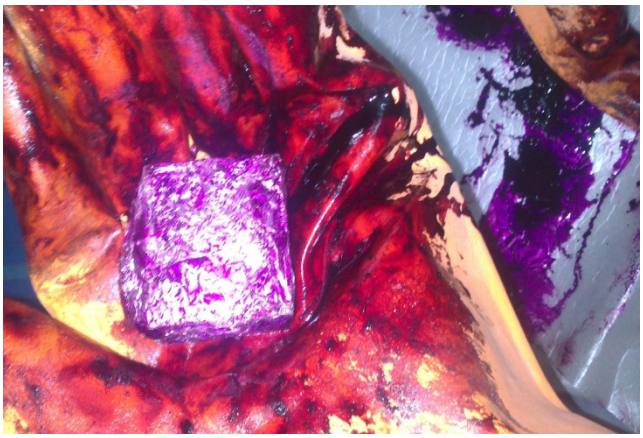


Fig. 6 vented ceramic filter

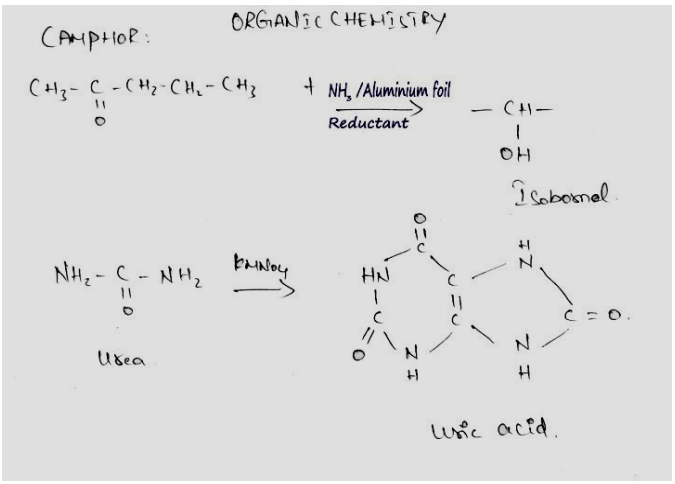
Fig. 7 Testing

5. CHEMICAL REACTION

Reduction of camphor with $LiAlH_4$, mainly leads to exo-Alcohol(IsoBorneol).Reduction of camphor occurs by active metals in liquid NH_3 which occurs by electronation - protonation mechanism.due to the presence of NH_3, Al foil is made as reductant which reduces the CO_2 emission and thermal raadiation to the external environment.

6. RESULT AND DISCUSSION

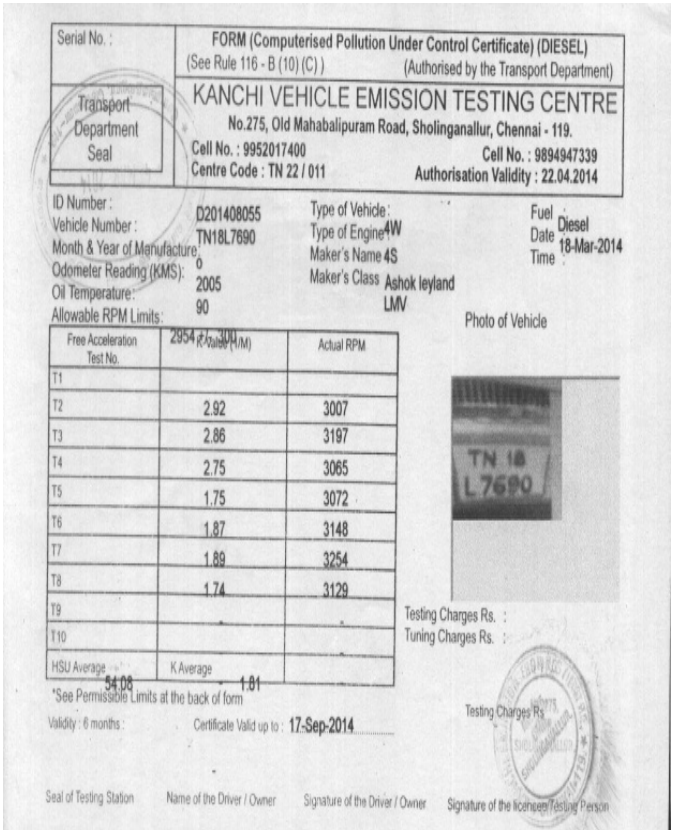
The catalytic converter is priced high and the nitrogen oxides are not fully reduced in the exhaust gases. By using the ceramic filter, it is capable of reducing the emission gases to a great extent and it is capable of withstanding the high temperature. Due to the oxidising agents, the CO and HC gases are reduced and the cost of these oxidising agents are very less hence it is economic when compared with catalytic converter.The ceramic filter provides an effective way to ensure filter regeneration by removing the system dependency on exhaust temperature and economical.



7. TEST REPORTS

The Detailed testing report of Before and after of the same vehicle with the project 30 cm

from the exhaust tail pipe as the projection mapped from the exhaust testing centre aided from government pollution control board.



Serial No. :

FORM (Computerised Pollution Under Control Certificate) (DIESEL)
(See Rule 116 - B (10) (C)) (Authorised by the Transport Department)

Transport Department Seal

KANCHI VEHICLE EMISSION TESTING CENTRE
No.275, Old Mahabalipuram Road, Sholinganallur, Chennai - 119.
Cell No. : 9952017400 Cell No. : 9894947339
Centre Code : TN 22 / 011 Authorisation Validity : 22.04.2014

ID Number : D201408055
Vehicle Number : TN18L7690
Month & Year of Manufacture : 0
Odometer Reading (KMS) : 2005
Oil Temperature : 90
Allowable RPM Limits : 2954 +/- 300

Type of Vehicle : 4W
Type of Engine : 4S
Maker's Name : Ashok leyland
Maker's Class : LMV

Fuel : Diesel
Date : 18-Mar-2014
Time :

Photo of Vehicle

Free Acceleration Test No.	R-Value (RPM)	Actual RPM
T1		
T2	2.92	3007
T3	2.86	3197
T4	2.75	3065
T5	1.75	3072
T6	1.87	3148
T7	1.89	3254
T8	1.74	3129
T9		
T10		
HSU Average : 54.08	K Average : 1.81	

Testing Charges Rs. :
Tuning Charges Rs. :

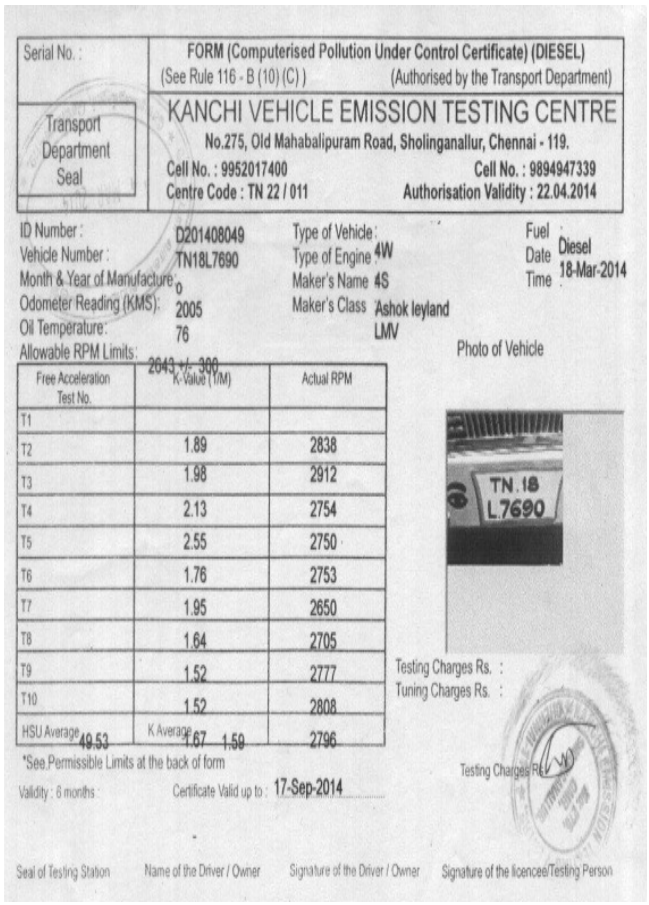
*See Permissible Limits at the back of form

Validity : 6 months : Certificate Valid up to : 17-Sep-2014

Testing Charges Rs

Seal of Testing Station | Name of the Driver / Owner | Signature of the Driver / Owner | Signature of the licensee/Testing Person

Fig. 7 Before Exhaust Treatmment



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KANCHI VEHICLE EMISSION TESTING CENTRE
No.275, Old Mahabalipuram Road, Sholinganallur, Chennai - 119.
Cell No. : 9952017400 Cell No. : 9894947339
Centre Code : TN 22 / 011 Authorisation Validity : 22.04.2014

ID Number : D201408049
Vehicle Number : TN18L7690
Month & Year of Manufacture : 0
Odometer Reading (KMS) : 2005
Oil Temperature : 76
Allowable RPM Limits : 2643 +/- 300

Type of Vehicle : 4W
Type of Engine : 4S
Maker's Name : Ashok leyland
Maker's Class : LMV

Fuel : Diesel
Date : 18-Mar-2014
Time :

Photo of Vehicle

Free Acceleration Test No.	K-Value (1/M)	Actual RPM
T1		
T2	1.89	2838
T3	1.98	2912
T4	2.13	2754
T5	2.55	2750
T6	1.76	2753
T7	1.95	2650
T8	1.64	2705
T9	1.52	2777
T10	1.52	2808
HSU Average 49.53	K Average 1.67 1.59	2796

TN.18 L.7690

Testing Charges Rs. :
Tuning Charges Rs. :

*See Permissible Limits at the back of form

Validity : 6 months Certificate Valid up to : 17-Sep-2014

Testing Charges R

Seal of Testing Station Name of the Driver / Owner Signature of the Driver / Owner Signature of the licencee/Testing Person

Fig. 8 After Exhaust Treatment

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