



Post pollution control Method for C. I. Engine automobiles using Nano-coated Catalytic converter

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Abstract

The pollution level due to the exhaust emissions from diesel engine based automobiles has become an issue of major concern in today's scenario. Some of the cities have started thinking on an odd and even formula to control the pollution rate. Nano-particles coated on catalytic converter can be very helpful in this regards. Nanotechnology plays a vital role in the formation of new methods and new products, to improve present production equipments and for producing innovative materials having better performance leading to less consumption of energy resources and less environmental degradation. The present research work is based on contribution of nano-particles in the field of automobile pollution control. When the change of particle size from micro to nanotakes place, it causes significant change in the material properties. This research work also underlines the atomic activity of nano-particles used for pollution prevention from the C.I. engine based automobiles.

Keywords: Automobile, Catalytic converter, Nano-particles, pollution, Prevention, Size.

Introduction

The exhaust emissions from automobiles are mainly due the incomplete combustion of fuel. These exhaust emissions from the automobiles are affected by many factors like the running condition of the engine, combustion conditions, fuel composition and the air-fuel ratio. When the fuel injection system of an automobile does not function properly, it leads to an increase in the emissions rate of the exhaust components. The emissions from automobiles mainly compose of pollutants like lead particles, carbon monoxide and many other pollutants. Inhaling carbon monoxide hampers the supply of oxygen from blood to the tissues by forming carboxy-hemoglobin causing different diseases like breathing problems, skin problems which can prove to be fatal¹.

Carbon dioxide present in the atmosphere is the main reason for to global warming. Apart from human beings, the major contributors of carbon dioxide in atmosphere are the two-wheeler automobiles. Carbon monoxide emitted from automobiles is also considered to be the most toxic pollutant. The emission of harmful gases and exhaust emissions from the automobiles can be reduced by using catalytic converter in the automobiles. The catalytic converter helps in the oxidation and thereby making the pollutants less harmful to the atmosphere².

Nanotechnology is the also considered as the generation next technology or the technology for the future. It is vastly gaining popularity and acceptance due to improved results,

better performance, reduced pollution and widespread utility. It is also very helpful in replacing the existing production method with improved performance methods, thereby, leading to a reduced consumption of energy and environmental protection³.

Materials and Methods

Nanotechnology offers great potential in providing innovative approach towards reducing the pollution in air, water and land. It is also beneficial in improving the performance of conventional technologies used in cleanup process⁴. The rate at which the automotive industry is hampering the environment makes the application of nanotechnology mandatory to prevent further damage. Malfunction of the engine systems like the fuel injection system causes an increase in the exhaust emissions⁵.

The exhaust emissions from the automobiles include gases like Carbon dioxide, Nitrogen oxide, Carbon monoxide, unburnt hydrocarbons and lead⁶. An exhaustive description on the utilization of nano-particles and nano-technology in the field of automobile pollution control was presented⁷. The diesel engine based automobiles have become a major concern in today's scenario. The nano-particles can prove to be very helpful in this regards due to their very small size⁸. The different nano-particles that can be used for coating on the catalytic converter are platinum, palladium, gold, copper, iron oxide. The atomic activity of the nano-particles is very helpful in effective reduction of exhaust emissions which

include carbon monoxide, hydrocarbons and nitrogen oxides⁹.

The two methods for pollution control from the tail pipe of C.I. Engines are the pre-pollution and post pollution control methods. The post pollution control method is more cost effective and easy to be implemented¹⁰. Catalytic converter coated with nano-particles is used in post pollution control method. A copper coated sieve was used in a catalytic converter to control the exhaust emissions. A gas analyzer was utilized to measure the concentration of exhaust emissions before and after using catalytic converter⁶. Incomplete combustion of the fuels leads to the emission of unburned hydrocarbons. The emission of the unburned hydrocarbons is also used for measuring the efficiency of combustion. The treatment of exhaust gas is basically a cleaning action before the exhaust emissions are vented out into the atmosphere. They are made to pass from catalytic converter before entering the atmosphere¹².

Results and Discussion

Results: Air pollution in the atmosphere can be reduced by the use of nano-particles in the catalytic converter. Nano-particle catalysts help in increasing the speed of chemical reactions involving transformation harmful exhaust emissions from various automobile sources into less harmful gases. The exhaust emissions from C. I. engines have become a very serious threat to the environment and needs to regulate. Out of the pre-pollution and post - pollution control methods for automobiles, the post - pollution control method is preferred on account of its comparatively less cost, easier implementation and higher effectiveness.

Post-pollution control method generally involves the application of nano-particles coated catalytic converter in which the catalytic reaction of the exhaust emissions takes place and the harmful exhaust emissions gets converted to less harmful gases, thus, reducing the level of air pollution.

Discussion: This research work focuses on the application of the nano-particles in the area of automobile pollution control. The change of particle size from micro to nano causes a substantial change in the material properties. These properties are very effective in the area of pollution control from C. I. engine automobiles. Nano-particles are applied on the catalytic converter attached to the tail-pipe of C. I. engine automobiles.

Different metal nano-particles can be used for applying on the catalytic converter. Generally, catalytic oxidation and catalytic reduction reactions take place inside the catalytic converter. As result of the above reactions, the concentration of harmful exhaust emissions is reduced and a cleaner and greener atmosphere can be achieved by using this post pollution control method for C. I. engine automobiles.

Conclusion

The present research paper is based on the control of exhaust emissions from automobiles using nano-particles which act as a catalyst. The nano-particles exhibit special properties which are different from the bulk materials due to their nano-size. These properties can be used to effectively reduce the level of pollution in the atmosphere, especially due to the C. I. engine based automobiles. This research paper paves the way for further work in this direction which may include the design of the catalytic converter and experimentation.

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