



**Research Article**

## APPLICATION OF NANO TECHNOLOGY IN AUTOMOBILE SECTOR

**Sitanshkumar Dhirajlal Golwala\***

Mechanical Engineering Department Polytechnic, the Maharaja Sayajirao  
University of Baroda, Vadodara

### ARTICLE INFO

#### Article History:

Received 04<sup>th</sup> May, 2018

Received in revised form 16<sup>th</sup>

June, 2018 Accepted 25<sup>th</sup> July, 2018

Published online 28<sup>th</sup> August, 2018

#### Key words:

Nano material, Automobile, Nano technology,  
Nano steel, Nano coating

### ABSTRACT

With rapid growth of automobile sector and tough competition prevailing in automobile sector all over the world, question regarding safety, pollution reduction, comfort, user friendly, low cost and fuel efficient car are becoming most urgent. The customer always demand low cost, fuel efficient, user friendly vehicles and this is accomplished through the use of Nano-technology in the automobile sector. The addition of nano materials in various parts of automobile increases their durability, strength and efficiency. This paper focuses on application of innovative product in the automobile sector through the use of nano technology.

Copyright©2018 *Sitanshkumar Dhirajlal Golwala*. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### INTRODUCTION

The basic unit of nano technology is nano meter and is equal to one billionth of meter. It deals with nano sized particles and device. Any physical substance which has dimension below 100 nm is called nano material. Nano technology is on the scale of 1 nano metre to 100 nano meter. Nano technology involves measuring, manipulating matter at this scale. At this level physical & chemical properties of materials differ from properties of individual atoms and molecules.

Due to tough competition in the car market and demand of low cost, user friendly & fuel efficient car, automobile sector invest heavily in research and development. Application of the Nanotechnology in automobile sector results in light weight but stronger automobile parts, improved engine efficiency, increased safety, and reduce fuel consumption. At present companies like Ford, BMW, General motors, Fiat, Honda extensively used nano material in their cars. Nano materials enhanced performance and cost effectiveness of automobiles and in coming years it will become more and more viable as harder, lighter and stronger materials.

#### *Nano Materials for Automobile Sector*

##### *Corrosive Resistance Nano Coat*

Cr (III) coating is done over automobile body to protect automobile body against corrosion. However, the coating of Cr (III) is not long lasting and little toxic in nature,

Therefore in order to solve this problem three layer coating is applied on the steel namely zinc, Cr(III), and  $\text{SiO}_2$  coating. This means that first coating on the steel is done with zinc, then on the zinc coating Cr (III) enriched layer is applied and then on Cr (III) coating  $\text{SiO}_2$  coating is applied on the steel.

##### *Nano Steel*

High strength but light weight automobile can be produced by using nano steels. Nano particles of metallic carbon nitride when embedded with steel increases its strength. Five to ten nano meter of carbon nitride when embedded in steel can significantly improve the strength of the steel. High strength steel is required to look after high impact intensity of automobile during accident/collision.

##### *Nano Paint*

Nano Paint has wear resistance property and maintains paint look, as it is for a long period of time. It consists of organic binder & inorganic nano particles which has high elastic and high strength property respectively. Wear resistance property of nano paint is due to ceramic particles embedded in nano meter range in the final varnish layer. The closely packed particles of nano material make paint wear resistant.

##### *Nano Car Glass*

The weight of glass in the car is reduced to a great extent by replacing mineral glass with polymer glass. In order to increase wear and impact resistance of polymer glass, it is coated with paints having aluminium oxide nano particles.

\*Corresponding author: **Sitanshkumar Dhirajlal Golwala**  
Mechanical Engineering Department Polytechnic, the  
Maharaja Sayajirao University of Baroda, Vadodara

### **Chassis Design Using Nano Material**

Reduction of automobile weight is an important concern for automobile manufacturer because it leads to reduced fuel consumption. It is possible to reduce weight with same mechanical strength by incorporation of nano particles at nano scale. Nano thermoplastic material like polycarbonates, polyamide (nylon), polyesters etc allows weight reduction to a considerable extent compared to conventional steel chassis parts.

### **Nano Lubricating oil Additive**

Lubricating oil is used to reduce wear and friction in automobile engine. Addition of Nano particles of material like Titanium oxide, Copper, Copper Oxide, Iron, and Nickel in engine oil significantly improved lubricant properties.

### **Nano Fiber Interior Filters**

Enhancing comfort for customer is as an important as fuel consumption reduction. The human comfort is highly affected by inside air quality. The air inside car needs to be filtered because it contains gases pollutant. Nano fibers interior filters achieved this target and has superior properties compared to conventional filters.

### **Nano Technology in Automobile Tyres**

Research shows that addition of 30 percentage of filler material like carbon black and silica in tyres materials improves properties like rolling resistance, abrasion resistance, increase tyre life and durability, lower weight, reduces friction and gives superior performance.

### **Reduction in Pollution by Vehicle**

The exhaust emission in a automobile is reduced to a considerable extent through the use of catalytic converter. It consists of high grade steel housing which has catalytically active material for conversion of pollutants to non toxic gases. By optimal interaction of exhaust gases with catalytic coating, the rate of chemical transformation in to harmless substance increases.

### **Increase in Heat Transfer through Nano Fluids**

It is a mixture in which small nano sized particles of metal oxides, graphene flakes (which is consist of pure carbon), ceramic particles, carbide etc are dispersed through out in a base fluid to enhance heat transfer characteristics of fluid. The common base fluid used in nano fluid is water, ethylene glycol, oil and water.

The heat transfer of coolant can be increased by using nano fluids. The improved heat transfer results in smaller heat exchanger size which in turn results in reduced weight of the automobile. The reduced weight of automobile increases the mileage of the automobile.

### **Nano Coating For Engines Parts**

There is considerable loss of power due to friction in various parts of the engine. The most important source of frictions are piston, crank, valve train, bearing etc. The use of zirconium ceramic coatings on various parts of the engine like cylinder walls, piston rings, bearing surface reduces the friction, abrasion and thus helps in improving fuel economy, increases oil burning rate and reduces pollution etc.

### **Anti Glare Mirrors**

During driving reflection and glare is dangerous because it affects the visibility. A nano structured anti glare and anti reflective coating composed of magnesium fluoride which when applied on dash board, front and rear windshield mirror significantly improves visibility. Anti reflective and Anti glare glass help us to reduce glare of head light while driving at night.

### **Nano Windshield**

During heavy rain, snow, fog, it is difficult to drive car because of poor visibility due to accumulation of rain water, snow on the windshield of a car. This problem is overcome by the use of hydrophobic nano coating on the glass surface. Use of such shield results in hydrophobic glass surface which causes raindrops, snow to fall away easily, leaving glass surface dry. For windshield coating hydrophobic materials like manganese oxide polystyrene nano composite, zinc oxide polystyrene composite, silica nano coating are used. Silica based coatings are gel based, most economical and can be applied easily. Oxide based coatings are more costly than silica based coating but they are durable.

### **Pleasant Smell inside Car**

The car interior contains different chemicals like paint, solvent and adhesive. With the help of nano particles of gold palladium it is possible to produce purer and completely natural perfume compounds which produces pleasant odour inside the car.

### **Nano Fuel Additive for Efficient Combustion**

Fuel additives like Energy efficient Ee fuel F2-21 which is composed of 2 methoxy methylethoxypropanol, 2 Ethylhexyl nitrate (2 EHN), 1Ethylene glycol worked as a catalyst for combustion reaction and reduce soot, tar and clinker formation due to incomplete combustion of fuel. Ee fuel increases mileage by 10 to 20 %. It increases the vaporisation of fuel, increases the amount of fuel burnt as well as stabilizes the burning rate.

### **Nano Technology Based Automobile Textile**

Textile especially fabric material are used in various parts of cars such as doors, safety belts, seat covering, parts of dash board, boot carpet etc. With the help of nano technology the properties of a fabric can be improved like (a) anti microbial and anti bacterial property (b) self cleaning (c) Fire retardation. The coating of silver, titanium oxide, copper, zinc oxide, gold etc are applied on fabrics to enhance anti microbial property. Silver is commonly used to increase anti bacterial properties. In order to make hydrophobic surface, materials like silica, fluoro containing polymers nano particles were applied in the form of coating on a fabrics which is made of nylon, cotton or polyester. Materials like antimony, aluminium, tin, bromine, chlorine and phosphorus based compounds are used as fire retarding.

## **CONCLUSION**

Today, nano technology will emerge as a key technology in automobile sector due to their improved efficiency and low environmental effects. Automobile sector consumes a considerable amount of fossil fuel for its energy requirements and emits almost one third of all green house gases. In this

situation it is necessary to achieve fuel economy in the automobile sector through use of a nanotechnology and through weight reduction. It is important not only to reduce green house gases emission but also provide energy security on a regional basis. There is a wide scope of improvement in efficiency of automobile due to application of nano technology. The properties of different parts of automobile is increased to a great extent through the use of nano technology. The nano technology based future car will be faster, safer, lighter and eco friendly.

## References

1. Danuta Kotnarowska, Maągorzata Wojtyniak, 2007. Nanotechnology application to automotive coating manufacturing, *Journal of KONES Power train and Transport*, Vol.14.
2. Durairajan, A, Kavita T, Rajendran, A, Kumaraswamidias, LA. 2012. Design and Manufacturing of Nano Catalytic Converter for Pollution Control in Automobiles for Green Environment. *Indian J. Innovations Dev.* 1(5): 315-319.
3. Edward Wallner, Bruce Myers, D.H.R Sarma, Suresh Shah, Suresh Chengalva, Gary Eesley, Coleen Dykstra, Richard Parker and David Ihms,. 2010 "Nanotechnology Applications in Future Automobiles", *SAE International*.
4. Hartmut Presting, Ulf Konig, 2003 "Future nanotechnology developments for automotive applications," *Materials Science and Engineering C*, pp.737-741.
5. K. Arivalagan, S. Ravichandran, K. Rangasamy, E.Karthikeyan, 2011. Nanomaterials and its Potential Applications, *International Journal of Chem Tech Research*, Vol. 3, pp.534-538.
6. M., Twigg. 2006. Roles of Catalytic Oxidation in Control of Vehicle Exhaust Emissions. *Catalysis Today*. 117 (4): 407-418.
7. Michał Ciałkowski, Michał Giersig, Antoni Iskra, Jarosław Kałużny, Maciej Babiak, 2008. Selected possible applications of Nanomaterials in Automotive Industry", *Journal of Polish Cimac*.
8. Presting, H.; Konig, U. 2003. Future nanotechnology developments for automotive applications. *Mater Sci Eng C*. 23., 6-8, 737.
9. P.Louda, 2007. Applications of thin coatings in automotive industry, *Journal of Achievements in Materials and Manufacturing Engineering*, Vol. 24.
10. Sanjiv Tomar, 2012. Innovative nano technology applications in automobiles, *International Journal of Engineering Research & Technology (IJERT)*, 1(10).
11. Wen D, Lin G, Vafaei S, Zhang K. 2009. Review of nano fluids for heat transfer application Particuology; 7:141-50.

### How to cite this article:

Sitanshkumar Dhirajlal Golwala (2018) 'Application of Nano Technology in Automobile Sector', *International Journal of Current Advanced Research*, 07(8), pp. 14622-14624. DOI: <http://dx.doi.org/10.24327/ijcar.2018.14624.2659>

\*\*\*\*\*