Catalytic Converters

One of the clay sheets separating the different chambers of a catalytic converter.

An experimental new converter that will greatly reduce the harmful emissions by increasing the temperature.

Fast Facts

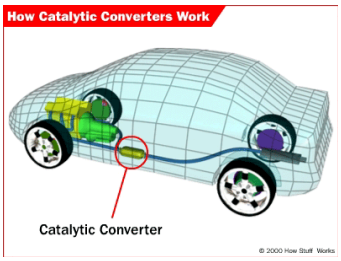
- One of the pollutants produced by your engine is the same as the laughing gas dentists use.
- Most of the pollution put out by your car occurs during the first five minutes before the catalytic converter has warmed up.
- Catalytic converters add about $500 to the cost of your car.
- Catalytic converters use platinum and rhodium which are more precious than gold.
- Catalytic converters cut down on the harmful emissions such as carbon monoxide, nitric oxide, and unburned gasoline from your car.

Introduction

The burning of fossil fuels is generally a very clean reaction, meaning it does not create much pollution. However, when combustion occurs with either too little or too much air, dangerous chemicals are produced, such as carbon monoxide and nitric oxide. Catalytic converters aid in the transformation of these pollutants into less harmful substances, like carbon dioxide and water.

How does a catalytic converter work?

The most common catalytic converter is located between the engine and muffler on your car. Essentially, it consists of a can that is separated into many sections by clay sheets. These clay sheets have dozens of very fine holes in them. These holes are lined with a thin metal oxide and small particles of platinum and rhodium. Creating many small surfaces on the metal is necessary because reactions only happen on the surfaces and these metals are very expensive. Chemicals like carbon monoxide and nitric oxides bond to the surfaces of these metals as they react to form less harmful gases such as carbon dioxide, nitrogen, oxygen and water.



What is BNL doing?

With the increased government regulations, cars need to become more fuel-efficient and produce less harmful emissions. Therefore, manufactures are looking for better ways to increase the effectiveness of catalytic converters. At BNL, scientists are looking into different materials, different metals, and oxide layers to react with the harmful gases. If less expensive and more efficient materials can the found, then the cost and weight of the catalytic converters can be reduced. If better metal oxides can be found, nitric oxide emissions could be greatly lowered.

How is synchrotron light used?

In order to check for the effectiveness of different metals and metal oxide combinations, samples are shot with an x-ray beam to free electrons. By measuring the energy of the electrons it can be determined which elements they came from. This is how scientists can determine if one combination is more effective than another.

How will these studies improve auto pollution in the future?

This research will hopefully one day result in more efficient and less expensive catalytic converters.

For more information, you can contact:

Dr. David R. Mullins
Oak Ridge National Laboratory
PO Box 2008, MS 6201
Oak Ridge, TN 37831-6201

Phone: 865-574-2796
FAX: 865-576-5235
E-mail: mullinsdr@ornl.gov
http://www.ornl.gov/schcg/schcg_home.htm