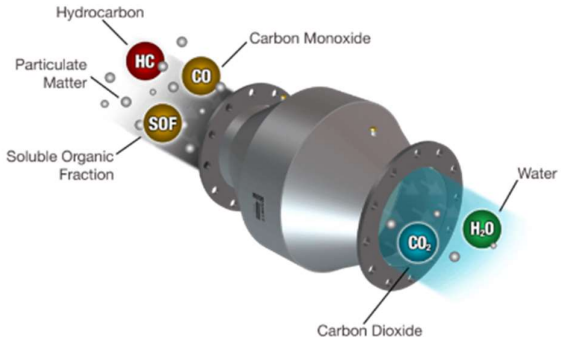
DOC, Diesel Oxidation Catalyst

The Diesel Oxidation Catalysts (DOC) is a honeycomb catalytic converter, made by Ceramic or Silicon Carbide or Metallic substrates, specifically designed, promoting oxidation of exhaust gas components by oxygen present in diesel exhaust gas, to oxidate Carbon monoxide (CO), Hydrocarbons (HC), diesel particulates Organic Fraction (OF), as well as aldehydes or PAHs.
The DOC provides the first step of the exhaust gas treatment. The converter is composed by many parallel channels "*flow through*", covered by a layer of platinum group metals Pt / Pd / Rh (called PGM) to improve oxidation capacity, which provide a highly catalytic contact area for the exhaust gasses.
The catalysts are based on ceria-zirconia-alumina (CeO_2-ZrO_2-Al_2O_3).
Alumina (Al_2O_3) is the main material in the washcoat formulations due its stability at high temperatures.
A ceria-based material (CeO_2) is generally dispersed or incorporated into the alumina layer to provide oxygen storage capacity, improving conversion rates.
Generally, a solid solution of ceria-zirconia (CeO_2-ZrO_2) is used instead of pure ceria: the inclusion of zirconium ions can improve the oxygen storage capacity of the material and the thermal stability.
The oxidation takes place as the hot gases contact the catalyst. The exhaust pollutants are then converted into harmless substances: carbon dioxide and water.



The oxidation of hydrocarbons and CO can be described by the following chemical reactions:

- [Hydrocarbons] + O_2= CO_2+ H_2O
- CnH_2m+ (n + m/2) O_2= nCO_2+ mH_2O
- 2CO + O_2= 2CO_2
- 2NO + O_2= 2NO_2

The oxidation of HCs also results in a reduction of diesel smells.
The oxidation of NO to NO_2 is essential for the operation of Diesel Particulate Filters (DPF) positioned downstream of the oxidation catalyst. A high NO_2/NO ratio is requested since Nitrogen dioxide promote passive regeneration of DPF.