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Use of bio-diesel as a soot inhibitor in diesel engines

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Diesel combustion emission results in a complex mixture consisting of a wide range of organic and inorganic compounds distributed in the gaseous and particulate phases. The particulate phase is commonly referred as soot. Soot particulate size in diesel emissions is very small (90% of them are less than 1µm), making them conveniently breathable with air. These particles adsorb in chemicals onto their surfaces. The mechanisms that produce soot in flames are among the most important unresolved problems of combustion science. The soot formation process starts with fuel containing 12 to 24 carbon atoms per molecule with hydrogen to carbon (H/C) ratio of about 2. This process ends up with molecules having about 10^5 carbon atoms and H/C ratio of 0.1.

Research carried out in combustion science has shown that aromatic and polycyclic aromatic hydro carbon content has great influence on soot formation in diesel engines. Soot is formed at high temperatures such as 1000 to 2800 K, and pressures between 50 to 100 atm, even with sufficient oxygen for complete combustion of the fuel in the combustion chamber.

The current research was based on production of bio-diesel and experimental investigation into soot suppressing effect of bio-diesel. A range of blends of diesel fuel and bio-diesel was tested in an engine. Since bio-diesel is based on naturally occurring triglycerides, the absence of aromatic and polycyclic aromatic hydrocarbons is a great advantage in terms of self ignition properties. Further, bio-diesel contains certain amount of oxygen in the fuel itself. Though aromatic and polycyclic aromatic hydrocarbons are acted as precursors for soot in flames, bio-diesel does not provide necessary precursors for soot formation. It was revealed in the experimental investigation that bio-diesel in a blend of diesel fuel had a significant soot inhibiting effect.

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