Reduce Soot Emissions & Increase Combustion Engine Efficiency

A method of synthesis for generating oxygen storing nanoparticles, the methods for uniformly mixing said particles into both solid and liquid fuels, and the utility of said particles as a soot reducing additive.

Partial or incomplete combustion of hydrocarbon fuels, most often resulting from inadequate oxygen supplies within the fuel, results in atmospheric pollutants such as soot. Many approaches have focused on reducing the emission of such condensed particles, whether carbon based or other, by providing additives to increase the oxygen content. However, incompatibility and solubility issues have led to difficulty when combining the emissions-reducing additive with the fuel.

UCF researchers have developed a patented mixture to address these problems with novel nano-sized rare earth metal oxides. This fuel additive comprising engineered ceria nanoparticles when mixed with hydrocarbon-containing combustible fuels offers a significant increase in engine efficiency with a reduction in soot and other combustion by-products. The large surface-area-to-volume ratios of the particles and sufficient oxygen vacancies provide an adequate supply of oxygen for the combustion reaction, thus significantly reducing the soot by-products generated. Increased engine efficiency and less fuel consumption per mile traveled also result. The additive works by oxidizing polyaromatic hydrocarbons, precursors to soot formation, before they can form solid carbon particles (i.e. soot) during the combustion process. These nanostructures have excellent oxygen storage and can release oxygen when it is needed in order to combust all of the substrate efficiently.

The improved engine efficiency requires less fuel consumption per mile traveled in various vehicles, such as automobiles, defense vehicles, airplanes, ships, and other surface or air-bearing vehicles. In addition to vehicle consumption, this invention would benefit any company which is subject to emissions regulations, including businesses that use: power plant boilers, hog-fuel boilers, central steam heat boilers or waste incinerators.

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Benefits
- Increased engine efficiency
- Reduction of soot and other combustion by-products

Applications
- Vehicles: automobiles, defense, airplanes, ships
- Boilers: power plant, hog-fuel, central steam heat
- Waste incinerators

Tech Categories
Clean Technologies, Environmental Remediation

Keywords
nanoparticles, cerium, ceria, combustion, soot, hydrocarbon fuels, fuel additive

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