

Nanostructured Microemulsion as Alternative fuel “Water-diesel fuel”

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Abstract:

Microemulsions are macroscopically isotropic mixtures of at least a hydrophilic, a hydrophobic, i.e., water and oil, and an amphiphilic component. Their thermodynamic stability and their nanostructure are two important characteristics that distinguish them from ordinary emulsions which are thermodynamically unstable. (1)The water molecules solubilized in the interior of the water pool have properties different from those of bulk water. This makes reverse microemulsions applicable to many fields such as fuels, pharmaceuticals, metal extractions, media for chemical reactions and nanoparticle syntheses. (2)

Efforts have been made to reduce emissions of air pollutants associated with combustion processes whose sources include electric power generation and vehicular transportation. One possibility for the simultaneous improvement of combustion efficiency and reduction of emission of noxious substances is the use of special fuels, especially fuels which consist of a mixture of aqueous and non-aqueous phases, such as water in oil microemulsions. Such fuels allow an efficient combustion process in spite of comparatively low combustion temperatures.

Microemulsion based fuel formulations date back to 1976 when Gillberg and Friberg published a paper on the use of water in diesel microemulsions as fuel. Water incorporated in fuel vaporizes during combustion and acts as a heat sink, In the case of combustion of fuel in an internal combustion engine; water is also expected to assist in fuel atomization due to microexplosions phenomenon, which occurs during the evaporation of the water inside droplets of fuel. This lowers the peak combustion temperatures, which results in a drastic reduction in nitrogen oxides (NO_x) emissions, reduces the particulate soot formation and improves the combustion efficiency. (2, 3)

Oral Presentation

There are many reports about microemulsion fuel systems containing anionic, cationic or nonionic surfactant, in our work Bicontinuous and water in diesel microemulsions were formulated using single nonionic alkyl poly glycol ethers combined with hydrophilic alcohol ethoxylates. Currently Combustion experiment has being done on this formulation, experimentally water in diesel microemulsions should reduce the level of both nitrogen oxides and soot in the emission, meanwhile improves the combustion efficiency.

References:

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