

THE INFORMATION OF NEW CONTRIBUTIONS OF THE THESIS

The title of the thesis: **Study on synthesis and efficiencies of the new generation nanoemulsion additives for the DO fuel**

Major: Organic Chemistry

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New contributions of the thesis

1. The surfactant compounds suitable for making new generation nanoemulsions had been successfully synthesized, including: Synthesis of ethoxylated coconut oil diethanolamide surfactant containing ethylene oxide groups in the range of 8. HLB value range of the product is 6 - 8; Synthesis of fatty acid hydroxyethyl imidazoline surfactant from tall oil, with HLB range from 8-10; Synthesis of polyethylene glycol ester (PEG) of fatty acids by transesterification between methyl oleate and polyethylene glycol using MgO and hydrotalcite catalysts. This surfactant has the ability to stabilize the nanoemulsion system in the reverse nanoemulsion additive when combined with the 2 surfactants prepared above.

2. The new generation nanoemulsion additives had been successfully prepared including water-in-oil nanoemulsions dispersed at the nanoscale using a mixture of 3 surfactants (ethoxylated coconut oil diethanolamide, hydroxyethyl imidazoline and polyethyleneglycol ester) and high power ultrasonic dispersion method and nano iron oxide nanoemulsion additives composition, with nanoemulsion additives/nano iron oxide nanoemulsion additives ratio of 4/1 v.v.. New generation nanoemulsion additives for DO fuel efficiency on the bench test is 5.1% at full load and CO emissions reduction is 10.76%, HC reaches 11.46%, NO_x reaches 11.19% and PM reaches 5.52%, according to the ECER 49 test cycle at a low mixing ratio of 1/8,000 by volume

with a fuel nanoemulsion particle size of 2-4 nm, without affecting the basic properties of the fuel according to TCVN 5689:2018 and parts in direct contact with the fuel of the engine.

3. The mechanism of action of the new generation nanoemulsion additives had been proposed based on the combination of micro-explosion and heterogeneous nanocatalysts in enhancing the combustion efficiency of diesel fuel, reducing harmful gas emissions and soots.

Representative supervisor

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