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Aldehyde and ketone emission characteristics according to operating conditions of diesel engine using blended diesel fuel with hydrated n-butanol

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The objectives of this study is to investigate the emission characteristics, especially, aldehyde and ketone, from a single-diesel engine when using diesel, butanol, and water mixture. Characteristics of combustion and exhaust emission of blended fuels (Diesel+Butanol+Water) are compared with the results of the neat diesel according to operating conditions of the engine. The blended fuels are set of two groups (D10B2W and D10B5W). Both fuels have 10 wt% of butanol and each with 2 wt% and 5 wt% of water. Blending n-butanol and water with diesel holds the purpose of simultaneously reduce both particle matter (PM) and oxidizes of nitrogen (NOX) from the diesel engine. Four aldehydes (formaldehyde, acetaldehyde, acrolein, propionaldehyde) and one ketone (acetone) are mainly measured by DNPH-HPLC method. Engine operating conditions were two engine speed, one fixed injection quantity, and 4 different injection timings. For the aldehydes and ketone results, by adding alcohol fuel to the diesel have increased the amount of the carbonyl compounds than neat diesel. Also increasing the water amount leads to having more carbonyl compounds. Aldehydes and ketone tend to be produced more at low combustion temperature and when reaction time is short. NOX was clearly reduced at 900 rpm and this is enhanced when the content of water increased. But NOX reduction at 1900 rpm was minor from both blended fuels. At most of the engine operating conditions, the diameter of the PM(particulate matter) has reduced than neat diesel. But at the one of the engine operating condition, when using D10B5W fuel, the diameter of the PM have exceeded the neat diesel case resulting increased mass of PM.

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