Alcohol and ether as alternative fuels in spark ignition engine: A review
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Energy security and global warming concern are the two main driving forces for the global alcohol development that also have the effort to animate the agro-industry. Generally, alcohol and ether fuels are produced from several sources and can be produced locally. Almost all alcohol fuels have similar combustion and ignition characteristics to existing known mineral fuels. Mainly the ether fuels (MTBE and DME) are used as additives at low blending ratio to enhance the octane number and oxygen content of gasoline. The addition of alcohol and ether fuels to gasoline lead to a complete combustion due to the higher oxygen content, thereby leads to increased combustion efficiency and decreased engine emissions. The objectives of this paper are to systematically review the use of alcohols and ethers including butanol, methanol, ethanol, and fusel oil, MTBE, and DME as fuels in SI engine. Also, the current study has investigated the effects of performance (brake torque, brake power, BSFC, effective efficiency, and EGT), emissions (CO, CO2, NOx and HC) and combustion characteristics of SI engine with alcohol and ether. The increase in engine performance could be attained with an increased compression ratio along with the use of alcohol fuels which have a higher-octane value. Furthermore, alcohol and ether burn very cleanly than regular gasoline and produce lesser carbon monoxide (CO) and nitrogen oxide (NOx). On the other hand, the energy value of alcohol and ether fuels is approximately 30% lower than gasoline; thereby the specific fuel consumption (SFC) will increase simultaneously when using alcohol and ether as a fuel. Finally, this paper also discusses the impacts of alcohol on engine vibration, engine noise, and potential to be used as a gasoline octane enhancer. Alcohol can be used as a pure fuel in spark ignition engine, but it requires some modifications to the engine.