

## **A study of alcohol blended fuels in a new optical spark-ignition engine**

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### **Abstract**

A new single-cylinder optical spark-ignition engine has been designed, developed and employed to evaluate combustion of blends of gasoline, iso-octane and a variety of alcohols under part-load engine operation at 1500 RPM with port fuel injection. In particular, six fuels were tested; a pump-grade gasoline and a commercial E85, as well as iso-octane and splash-blended mixtures of iso-octane with 25% ethanol, 85% ethanol and 25% butanol. The latter alcohol is a potential second generation biofuel, so far subject to little detailed research. Differences in combustion between the tested fuels were studied using high-speed crank-angle resolved natural light flame imaging in conjunction with in-cylinder pressure analysis over batches of 100 cycles. The flame images were processed to infer the evolution of an equivalent flame radius during the early stages of combustion. The results demonstrated the effect of alcohol addition to iso-octane and benchmark comparisons with commercial grades of gasoline and E85.