

Comparison of particle number between the gasoline and hydrogen combustion engine and NOx reduction strategy in the hydrogen engine

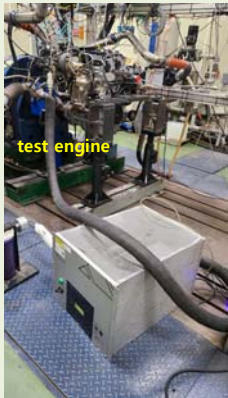
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Research subject

- In hydrogen internal combustion engine, the generation of particulate matter is expected to be extremely small compared to conventional hydrocarbon-based fuels.
- The number of particulate matter generated in gasoline and hydrogen direct injection engines was measured by using a 2L gasoline direct injection engine.
- To reduce nitrogen oxide, an experiment was conducted to see if nitrogen oxide can be further reduced through the application of exhaust gas recirculation(EGR) and post fuel injection strategy.

Experimental setup



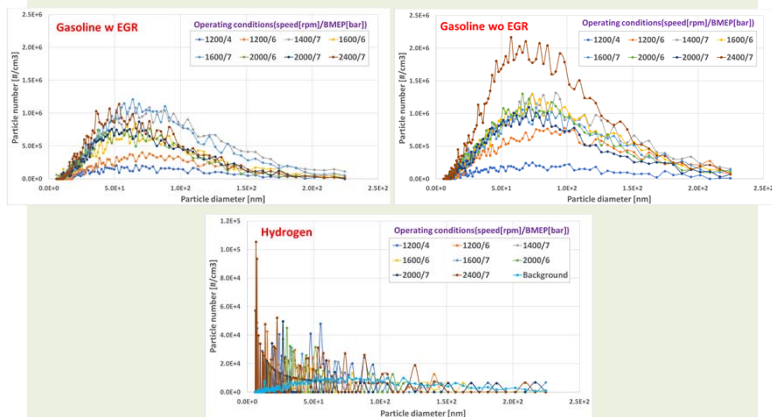
* Specification of a test engine

Displacement volume [L]	2.0 (4 cyl.)
Bore * Stroke [mm]	81 * 97
Compression ratio	10.5
Injection type	Direct injection
Ignition	Spark ignition

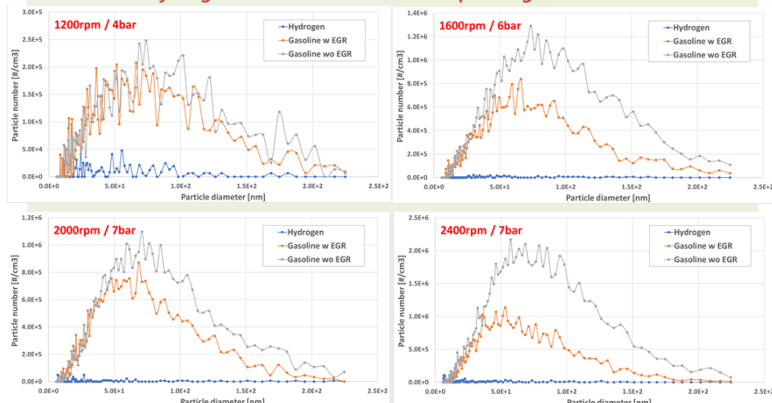
* Particle number measurement setup



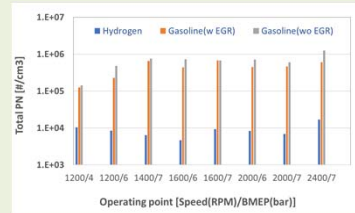
Particle measurement results



Hydrogen vs. Gasoline at various operating conditions



Summary of total particle numbers

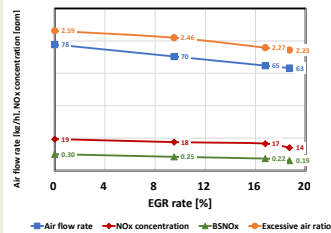


NOx reduction strategy in hydrogen engine

NOx reduction test by application of EGR

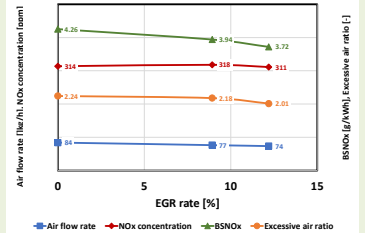
Low emission regime

NOx emission as varying EGR rates under 1,000 rpm

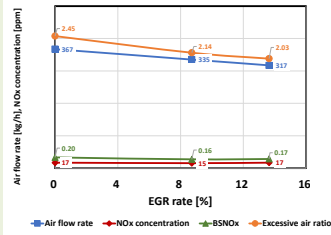


High emission regime

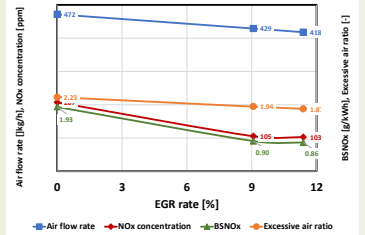
NOx emission as varying EGR rates under 1,000 rpm



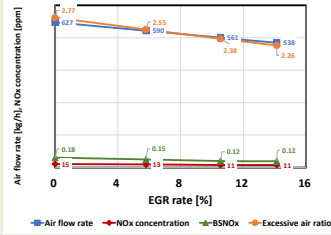
NOx emission as varying EGR rates under 3,000 rpm



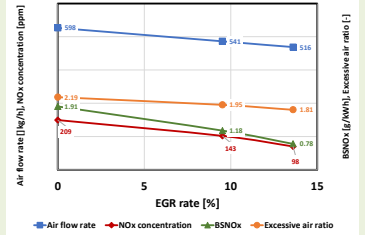
NOx emission as varying EGR rates under 3,000 rpm



NOx emission as varying EGR rates under 5,000 rpm

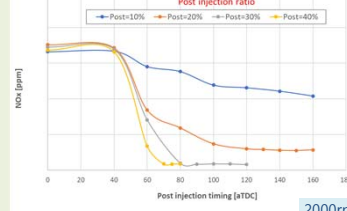


NOx emission as varying EGR rates under 5,000 rpm

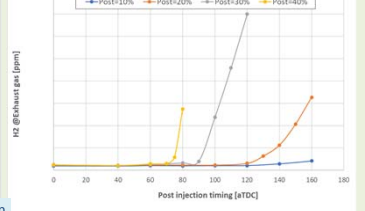


NOx reduction test by application of post injection

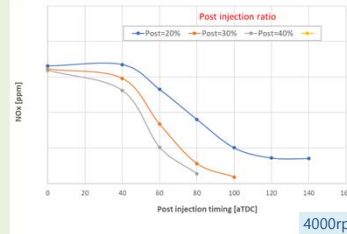
Post injection ratio



Post injection ratio



Post injection ratio



Post injection ratio

