論文 / 著書情報
Article / Book Information

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（博士課程）
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論 文 要 旨

THESIS SUMMARY

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要旨（英文 800 語程度）
Thesis Summary (approx.800 English Words)

It is essential to implement an efficient after-treatment system for internal combustion engines during the transitional period until the full adoption of cleaner technologies is accomplished. To attain net-zero emission by 2050, exhaust gases from automobile engines have emerged as a significant contributor to air pollution, which is 25% of total CO_2 emission, currently ranked as a second largest source, leading to a global concern for their adverse effects on public health. To reduce the CO_2 emission from internal combustion engines, thermal efficiency of internal combustion engines must be increased. On the other hand, the exhaust gas temperature will become as low as around 300 to 400 $^{\circ}C$ by increasing the engine thermal efficiency (i.e., greater than 50%). This is a challenging situation for the current design of exhaust gas aftertreatment system since it is designed for the exhaust gas temperature of above 700 $^{\circ}C$. Therefore, an innovative approach of future-proof catalyst which has lower light-off temperature with reliability, and low pressure-drop particulate filter is essential for the future aftertreatment system of IC engines with low exhaust gas temperature.

We manufactured the membrane particulate filters composed of various catalyst components were fabricated as a membrane on a conventional particulate filter substrate for the purpose of achieving higher soot filtration efficiency, enhancing soot oxidation temperature and other related objectives. In contrast to commercialized wash-coated filters, the catalyst particles were percolated as a membrane at the shallow area of the GPF substrate which results in a significantly increased in initial soot filtration efficiency and the ability to produce membrane filters with low pressure-drop. Here, in this dissertation, a three-way particulate filter was manufactured for the purpose of achieving higher initial soot filtration efficiency with low pressure-drop and reducing the emission of gaseous pollutants such as carbon monoxide (CO), unburnt hydrocarbons (HCs) and nitrogen oxides (NO_x) simultaneously in an integrated unit.

In the chapter 2, a new porosity measurement method, which was measured on the cross-section of the membrane filter, percolated with micro-sized agglomerated three-way catalyst particles using electron microscopy image analysis technique was