# 論文 / 著書情報
# Article / Book Information

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| 題目(和文) | 電子顕微鏡タイムラプス可視化を用いたスス酸化を伴うディーゼル微粒子フィルター再生に関する研究 |
| Title(English) | A study on diesel particulate filter regeneration process with soot oxidation through time-lapse visualization using electron microscopes |
| 著者(和文) | SrilomsakMek |
| Author(English) | Mek Srilomsak |
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（博士課程）
Doctoral Program

# 論 文 要 約

DISSERTATION OUTLINE

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| 系・コース：<br>Department of, Graduate major in | Mechanical Engineering | 系<br>コース | 申請学位（専攻分野）：<br>Academic Degree Requested | 博士<br>Doctor of | （ Engineering ） |
| 学生氏名：<br>Student's Name | Mek Srilomsak | | 指導教員（主）：<br>Academic Supervisor(main) | Professor Katsunori Hanamura | |
| | | | 指導教員（副）：<br>Academic Supervisor(sub) | _ | |

- Chapter 1: Significant role and long-term projections of internal combustion engines (ICEs) are still expected at least up until the year 2050 because of their energy efficiency. In parallel with developing high-efficiency ICEs, the emission control system is also a significant issue to be developed to comply with strictly emission legislation, especially for particulate matter (PM) or soot emissions. This study aims to clarify soot oxidation phenomena inside the walls of a practical DPF through oxidation analyses and visualization using scanning electron microscopy.

- Chapter 2, characterizations of various types of soot are done to differentiate soot obtained from different sources, and also to define an appropriate surrogate for diesel engine soot to be used in later part of this study.

- Chapter 3, images of soot oxidation in the DPF regeneration process are revealed, for the first time, at the particle scale. The visualization results were traced from initiation to completion of the DPF regeneration process. Soot oxidation phenomena observed at the particle scale were correlated to a shrinking core model supported by a nano-scale analysis of soot oxidation.

- Chapter 4, further discussion about soot oxidation kinetics during the regeneration process is reported. It explores the impacts of a wash-coated catalyst compared with a non-catalyzed case, NO2 gas addition on soot oxidation compared to O2 only, and the thickness of soot cake layer on the regeneration timing. The effects of these parameters are then discussed based on apparent activation energy estimated using an Arrhenius expression.

- Chapter 5, visual information of soot oxidation phenomena is revealed at a nano-scale. The role of O2 and NO2 on soot oxidation was investigated by considering the physical change of soot nanostructure before and after partial oxidation. Fringe analysis was employed to quantitatively differentiate nanostructural changes of soot subjected to various oxidizing agents. Furthermore, physical information reported in the final chapter is supportive of information of the chemical kinetics discussed in the previous chapter.