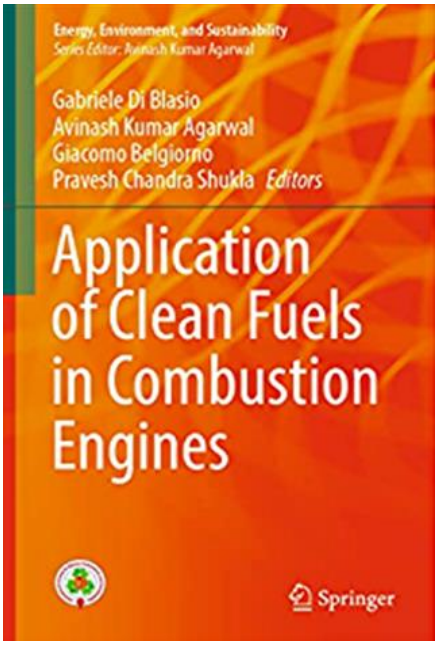

Application of Clean Fuels in Combustion Engines

Gabriele Di Blasio

ISSN 2522-8366 ISSN 2522-8374 (electronic)
Energy, Environment, and Sustainability
ISBN 978-981-16-8750-1 ISBN 978-981-16-8751-8 (eBook)
https://doi.org/10.1007/978-981-16-8751-8

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Contents

Biofuel combustion generated particles analysis

Farzad Jaliliantabar [a] , Abdul Adam Abdullah [b] , Paolo Carlucci [c] , Sudhakar Kumarasamy [b]
[a] College of Engineering, Department of Mechanical Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300, Gambang, Kuantan, Pahang, Malaysia
[b] Faculty of Mechanical and Automobile Engineering, Universiti Malaysia Pahang, 26600, Pekan, Kuantan, Malaysia
[c] Department of Engineering for Innovation, University of Salento, Lecce, Italy

ABSTRACT
Soot emission or carbon black is considered as a major challenge recently. Generally, internal combustion engines have been introduced as the main source of these materials specially in urban areas. Different methods are proposed to control soot emission of diesel engine such as DPF (Diesel Particulate Filter) which is attached to the engine exhaust line and the microstructure and size of NPs were introduced as important parameters on its efficiency. In addition, biodiesel has become widely accepted as an appropriate substitution for diesel fuel, however, the using of biodiesel fuel may change the structural characteristics of soot emission. It is observed that biofuel has higher soot oxidative reactivity, and it is more reactive than diesel fuel, which is an advantage for DPF regeneration. Smaller size of particles in biodiesel fuel soot compared to diesel fuel is mentioned as a reason for this phenomenon. For instance, it is reported that the fractal dimension of micro algae, cotton seed, waste cooking oil, eucalyptus oil, tea tree oil and diesel fuel is 2.02, 1.97, 1.85, 1.75, 1.80, 1.73, 1.69 (nm) respectively. Filtration efficiency which is a crucial characteristic of the DPFs for biodiesel fuel and diesel fuel was found to be much different. These differences are attributed to the morphology of the produced soot of the fuel burning. The source of the biodiesel fuel is introduced as an impactful parameter on engine NPs morphology and size. For example, the primary diameter of the soot emission from the above fuels is 20.1, 14.8, 14.8, 15.5, 14.5, 15, 17.5 and 20.75 nm, respectively. The result of these study reveals that structure and morphology of soot emission come from biofuel combustion is different from diesel fuel and these properties should be investigated for any unique biofuel resource individually. However, the smaller size of the biofuel combustion generated soot is an advantage of these fuels to enhance their oxidation reactivity.

KEYWORD
Biofuel; Engine; Soot microstructure; Particulate matter