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Effects of an anti-wear oil additive on the size distribution, morphology, and nanostructure of diesel exhaust particles

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ABSTRACT

This study focuses on the effects of an anti-wear oil additive on physical characteristics of particles exhausted from a diesel engine, by using fast particulate spectrometer, transmission electronic microscopy techniques. Results show that the oil additive may increase the number of particles via impacting the combustion reactions. We also conclude that, given the low fractal dimensions of aggregates, the particles exhausted from the fuel blended with the additive were mainly bonded in a cluster-cluster fashion. In addition, analysis of the nanostructure highlights that the degree of graphitization of the particles has also been influenced by anti-wear additive.

Keywords: Diesel particle emission; Anti-wear oil additive; Lubricant additive; Particle morphology;

1. Introduction

Diesel engines are widely used in stationary and mobile applications, particularly in a field where a high-power source is needed [1]. To date, diesel technology for automobiles has received considerable research interest due to its high efficiency and durability [2]. However, diesel engines are the dominant source of particulate emissions; they emit particulate matter at one to two orders of magnitude greater than gasoline engines [3].

These particulate emissions have a high specific surface area and are thus often involved in

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