PROTECTION OF DIESEL EXHAUST AFTERTREATMENT SYSTEMS: A THERMODYNAMIC AND EXPERIMENTAL EVALUATION

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To enable diesel engines to meet increasingly stringent emission standards, a variety of different exhaust aftertreatment systems may be employed. Depending on a manufacturer's philosophy, the most effective means of meeting emission targets may include fitting an engine with some type of particulate trap, an oxidation catalyst, or a NO_x catalyst or trap. One concern about using these aftertreatment devices on a diesel engine is the potential loss in catalytic activity as the aftertreatment system ages. The deposition of sulfur and phosphorus and subsequent catalyst poisoning is a principal cause of activity loss and reduced durability. Sulfur is found in the fuel and is present in the lubricant. The presence of phosphorus on the catalyst is attributable to the normal consumption of lubricant oil

In this paper, the use of a fuel additive to minimize the adverse impact of phosphorus and sulfur on catalytic exhaust aftertreatment systems is addressed. A theoretical approach is used to evaluate the driving forces that control catalyst protection. Experimental work that supports using the additive to improve catalytic durability in exhaust aftertreatment systems will be discussed. This work shows that the additive can be used to prevent deposition of phosphorus on the catalyst surface and to reduce the impact of sulfur on catalytic activity. The potential of this work with respect to enabling exhaust aftertreatment systems to meet high mileage durability goals will be discussed.