FUNDAMENTALS OF SULFUR TRAP FOR DIESEL ENGINE EMISSION CONTROL

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To meet the US EPA Tier II emission standards for light duty diesel vehicles, sulfur contents in the diesel fuel have to be significantly reduced from the current average 300 to 500 ppm to the proposed 10 to 30 ppm by 2004. Studies have shown that some catalysts used in the aftertreatment technologies, such as NO_x adsorber catalyst systems need to be protected from the sulfur poisoning even with the proposed low sulfur levels in the fuels. A well-designed sulfur trap is required to capture most of the sulfur compounds in the upstream of the aftertreatment system. Fundamental understanding of sulfur trapping mechanisms and performance, that is, trap capacity and efficiency will be investigated to provide baseline data for the sulfur trap design. The investigation will be conducted with bench reactor and engine testing cell. The results will be correlated with the fuel sulfur level, fuel economy, sulfur trap capacity, and the estimated useful trap life under the specified sulfur trap volume. To predict the maximum sulfur trap capacity, a simplified SO_x adsorption model will be developed based on the properties of the sulfur compounds interacting with the adsorption materials. Case studies of the sulfur trap design will be performed on a demo diesel vehicle.