Emissions Aftertreatment from Diesel Engine Exhaust

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Abstract:

Emissions from diesel engine exhaust have significant adverse impacts on human health and the environment. As a mitigation strategy, the US EPA has been setting stringent regulations on exhaust quality. Various aftertreatment technologies – most of them catalytic – are being developed and implemented to treat the emissions from diesel engine exhaust. Selective Catalytic Reduction (SCR) is currently considered as one of the most promising methods to reduce NO_x under an excess of Oxygen. The precious metal-based Diesel oxidation catalyst (DOC) can be used for oxidizing other harmful emissions such as carbon monoxide (CO), hydrocarbons (HC), and oxygenates (aldehydes). Catalytic or non-catalytic Diesel Particulate Filters (DPF) are developed for trapping and oxidizing the diesel soot particulates. Despite the extensive research on these technologies, comprehensive and predictive kinetic models for simultaneous prediction of multiple emissions oxidation/reduction are still lacking. Furthermore, modeling of integrated aftertreatment systems for emissions abatement is a critical step in meeting and exceeding the regulations.

This presentation will primarily focus on an overview of the diesel engine emissions regulations and detailed kinetic modeling of emissions aftertreatment technologies. Effect of sulfur impurities and aromatic components in the diesel fuel on catalyst deactivation will also be discussed.

Bio:

Ashish Mhadeshwar is an assistant professor in the Chemical, Materials, and Biomolecular Engineering (CMBE) department and the Center for Clean Energy Engineering (C_2E_2) at the University of Connecticut. Prior to joining UConn in 2010, he worked at GE Global Research, Niskayuna, NY, for four years as a senior research scientist. At GE, he worked on a number of research projects related to emissions reduction from diesel engine exhaust and CO_2 capture from post-combustion flue gas and pre-combustion syngas. Ashish has received a number of internal awards at GE for his contributions to the projects. He is a certified six-sigma green belt and a Level III TRIZ professional. Ashish received his Ph.D. from the Department of Chemical Engineering at the University of Delaware, where he developed hierarchical multiscale microkinetic modeling strategies for various H_2 production processes with Prof. Dion Vlachos. He received the Allan P. Colburn award for the best Ph.D. dissertation in Mathematical Sciences and Engineering departments from the University of Delaware. Ashish conducted his post-doctoral research at the University of Delaware in computational catalyst design for ethylene epoxidation with Prof. Mark Barteau. He has published 18 papers in peer-reviewed journals and 1 book chapter, as well as filed 10 patents.

Ashish lives in Storrs, CT with his wife, Anjana Bhat, who is also an assistant professor in the Department of Kinesiology at UConn, and their 4-year old son, Ashwin. He enjoys spending spare time with his family as well as playing cricket and racquetball.