Wilson Merchan-Merchan, J Nanomedic Nanotechnol 3:1
doi: http://dx.doi.org/10.4172/2157-7439.S1.04

OMICS Group Conferences
Accelerating Scientific Discovery

International Conference and Exhibition on
Nanotechnology & Nanomedicine
March 12-14, 2012 Omaha Marriott, USA

TITLE

Soot particle formation in laminar diffusion biodiesel and diesel fuel air-flames

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Soot particles derived from Canola Methyl Ester (CME), Soybean Methyl Ester (SME), a 50% mixture composed of Soybean Methyl Ester (SME) and Animal Fats (AF), and Diesel fuel were studied in a wick-generated open-air laminar diffusion flame using the thermophoretic sampling technique and transmission electron microscopy (TEM). Reconstruction evolution of soot particle formation in each flame along the burner centerline reveals the existence of two characteristic soot morphology regions. In all cases, polydisperse precursor particles are present in a flame region located in the lower part of the flame just above the burner's nozzle. The young particles experience carbonization and agglomeration as they move toward the flame tip forming the mature soot. Soot particle evolution (structural and size) was obtained along the axial flame axis for all of the tested flames. It was found that biofuel soot is composed of significantly finer particles (smaller diameters) than that produced using diesel fuel. Within the tested biofuels the soot from SME had the largest primary particle diameter followed by B50 SME/ B50 AF, with CME having the smallest primary particle diameter. Further examination of the nanostructure of the primary soot particles was also conducted using a HR-TEM imaging technique. It was found that the soot derived from biodiesel has a highly graphitic shell-core arrangement compared to diesel soot which exhibits far less graphitic structure as it consists of short, disconnected and not concentrically oriented graphene segments.

The support of the National Science Foundation through grant CBET-1067395 is gratefully acknowledged. The authors would also like to extend special thanks to Dr. Alan Nicholls and Dr. Ke-Bin Low from the UIC Research Resource Center for assistance in TEM studies, encouragement and helpful discussions. We would also like to thank Mr. Gregory Strout from the Samuel Roberts Noble Electron Microscopy Laboratory at the University of Oklahoma for help with high resolution studies on the JEOL-2010F field emission TEM. We would also like to thank Mr. Henry Oliver Tenadooah Ware for his day-to-day assistance on this project.

Biography

Wilson Merchan-Merchan received his Ph.D. from the University of Illinois at Chicago in the areas of Combustion & Nanotechnology in 2005. Currently he holds a faculty position at the University of Oklahoma. One of his areas of research areas focuses on the application of flames for the synthesis of 1-D and 3-D Transition Metal Oxide nano and micron-sized structures. His work in flame material synthesis has been broadly disseminated by publication in several journals such as Carbon, Chemical Physics Letters, Combustion and Flame, Nanotechnology, among others. Most recently, he has published his work in Carbon, Nanotechnology, Micron, and the Combustion Institute.