

PROFILE

Brendan Hall , NSF Graduate Fellow

NSF GK-12 Project: Northeastern University
[GK-12-PLUS \(Partners Linking Urban Schools\)](#)
URL: <http://www.gk12.neu.edu>

Thesis Title: Flame Synthesis of Carbon Nanotubes from Waste
Plastics

College/University: Northeastern University

Research Advisor: Yiannis Levendis

Degree Sought

Masters of Science

University Department and/or Lab

Combustion Lab
Mechanical Engineering Department

Research Focus

We are currently expanding on previous research into creating carbon nanotubes using diffusion flames and metal catalysts. The focus of the research is to identify the ideal fuels and conditions for growth and to further the range of fuels that have been investigated.

Description of Research

Carbon Nanotubes are crystalline, tubular, carbon structures with extraordinary mechanical, chemical, optical and electrical properties. These properties make carbon nanotubes potentially valuable in a wide range of applications. Current methods of synthesizing nanotubes are very expensive and it is cost prohibitive to include them in the design and applications of nanotubes to commercial products. Recently there has been research into the synthesis of nanotubes using common diffusion flames at atmospheric pressure. This method is energy efficient, providing a source of hot hydrocarbon gas through combustion. This method is appealing commercially due to the rapid time scale of production and the potential for scalability.

We are using waste polyethylene plastic as well as ethylene, ethyl alcohol and ethylbenzene as carbon sources for the growth of carbon nanotubes on transition metal catalysts. Our research is comprised mainly of investigating a range of flame conditions with each fuel and catalyst and identifying under which conditions nanotubes grow most efficiently.

Example of how my research is integrated into my GK-12 experience

My research involves a lot designing and executing experiments based on assumptions, which is a valuable skill that is taught in high school level science classes. I hope I can take my experience and help the students understand how what they are learning applies in the laboratory and how they can use experiments to further their understanding. I would also like to involve my previous industry experience to help them relate what they are learning to possible careers in the future.