

NSERC PIN: 500753

I. Contributions to Research and Development**A. Articles published and submitted in refereed journals**

- a) **Olatinwo, Mutairu B.**; Ham, Kyungmin; McCarney, Jonathan; Marathe, Shashidhara; Ge, Jinghua; Knapp, Gerald; Butler, Leslie, **(2016)** Analysis of Flame Retardancy in Polymer Blends Synchrotron X-ray K-edge Tomography and Interferometric Phase Contrast Movies. *Journal of Physical Chemistry B – ACS*. 120: 2612-2624 (PhD work).
- b) **Olatinwo, Mutairu B.**; Ham, Kyungmin; McCarney, Jonathan; Marathe, Shashidhara; Ge, Jinghua; Knapp, Gerald; Butler, Leslie, **(2016)** Study of Brominated Flame Retardant Additives with the Underwriters Laboratory 94 Burn Test, X-ray K-edge Absorption Tomography, and Phase Contrast Grating Interferometry. *Royal Society of Chemistry Soft Matter*, Submission date: , Number of pages: (PhD work).
- c) Oloyede, G. K.; Adaramoye, O. A.; **Olatinwo, Mutairu B.**, **(2015)** Chemical Constituents of Sandbox Tree (*Hura crepitans* Linn.) and Anti-hepatotoxic Activity of the Leaves and Stem Bark Extracts. *West Indian Medical Journal*, DOI: 10.7727/wimj.2015.247 (MSc work).
- d) Oloyede, G. K.; **Olatinwo, Mutairu B.**, **(2014)** Phytochemical Investigation, Toxicity and Antimicrobial Screening of Essential Oil and Extracts from Leaves and Stem Bark of *Hura Crepitans* (Euphorbiaceae). *Academia Arena*. 6: 7-15 (MSc work).
- e) Oloyede, G. K.; **Olatinwo, Mutairu B.**, **(2011)** In Vitro Antioxidant Activity of Extracts from the Leaves of *Hura Crepitans* (Euphorbiaceae) - A Comparison of Two Assay Methods. *Cell Membranes and Free Radical Research*. 3: 133-138 (MSc work).

B. Selected Conferences: Oral and Poster Presentations

- a) **Olatinwo, Mutairu B.***; Ham, Kyungmin; McCarney, Jonathan; Marathe, Shashidhara; Ge, Jinghua; Knapp, Gerald; Butler, Leslie, The Advanced Photon Source-Center for Nanoscale Materials Users Meeting, May 9–12, **(2016)**, Lemont, Illinois, USA, **Poster presentation** on Single-shot Grating Interferometry and X-ray K-edge Absorption Tomography Experiments for Analysis of Flame Retardants, **National** (PhD work).
- b) **Olatinwo, Mutairu B.***; Ham, Kyungmin; McCarney, Jonathan; Marathe, Shashidhara; Ge, Jinghua; Knapp, Gerald; Butler, Leslie, The Center for Advanced Microstructures and Devices (CAMD) Annual Users Meeting, April 29, **(2016)**, Baton Rouge, Louisiana, USA, **Poster presentation** on X-ray Imaging Techniques for Analysis of UL 94 Flame Retardant Samples, **Institutional** (PhD work).
- c) **Olatinwo, Mutairu B.***; Ham, Kyungmin; McCarney, Jonathan; Marathe, Shashidhara; Ge, Jinghua; Knapp, Gerald; Butler, Leslie, The 2nd International Conference on Tomography of Materials and Structures, ICTMS, June 29 – July 3, **(2015)**, Quebec City, Canada, **Oral presentation** on Chemical Analysis of the Flame Retardancy of Brominated Flame Retardants/Antimony Oxide with the Use of X-ray Synchrotron, Phase Contrast Interferometry, **International** (PhD work).
- d) **Olatinwo, Mutairu B.***; Ham, Kyungmin; McCarney, Jonathan; Marathe, Shashidhara; Ge, Jinghua; Butler, Leslie, 11th National Graduate Research Polymer Conference, June 1–4, **(2014)**, Lod Cook Conference Center, Louisiana State University, Baton Rouge, LA 70803, **Poster presentation** on Tomographic Phase Contrast Imaging of Flame Retardants in HIPS, **Regional** (PhD work).

- e) **Olatinwo, Mutairu B.***; Ham, Kyungmin; McCarney, Jonathan; Marathe, Shashidhara; Ge, Jinghua; Butler, Leslie, First Applied Polymer Technology, APTEC Meeting, November 22, **(2013)**, University of Southern Mississippi, **Oral presentation** on X-Ray Grating Interferometry for Dynamic Tomography of Brominated Flame Retardant and Antimony Oxide Additives in High Impact Polystyrene, HIPS, **Regional** (PhD work).
- f) **Olatinwo, Mutairu B.***; Ham, Kyungmin; McCarney, Jonathan; Marathe, Shashidhara; Ge, Jinghua; Butler, Leslie, The 1st International Conference on Tomography of Materials and Structures, ICTMS, July 1–5, **(2013)**, Ghent, Belgium, **Poster presentation** on Dynamic Tomography of Flame Retardants, **International** (PhD work).
- g) **Olatinwo, Mutairu B.***; Ham, Kyungmin; McCarney, Jonathan; Ge, Jinghua; Butler, Leslie, 68th Southwest Regional Meeting of the American Chemical Society, Nov. 4–7, **(2012)**, Baton Rouge, LA, USA, **Poster presentation** on Temperature Effect for Flame Retarded Polymer Blends, **Regional**, (PhD work).

II. Most Significant Contributions to Research and Development

- a) For the three publications during my MSc studies, I did the literature review on some medicinal plants as instructed by advisor, Dr. Mrs. Ganiyat Kehinde Oloyede. I found out that *Hura crepitans* (Sandbox tree) is biologically effective such as usage in treatment of leprosy; eczema etc. and less research were carried out with the plant materials. I collected the plants (leaves and stem-barks), dried and did solvent extraction to isolate the active organic compounds. Solvents of different polarity were used during the studies; purification of the compounds was done with the chromatographic techniques. The pure isolated compounds were structurally elucidated using spectroscopic methods such as nuclear magnetic resonance (carbon and hydrogen), mass spectrometry, Infra-red and ultra violet –visible spectroscopy. The data were interpreted with my advisor. I also collected some essential oils from the leaves of *Hura crepitans*, mainly used in perfumery industries.

We are not just interested in extracts and their compounds, but are interested in their medicinal/biological activities. This is because making compound is not all; researchers should also be interested in their applications to better human experience. Using the published procedures, I performed the brine shrimp lethality bioassay and antioxidant studies on the extracts to determine their level of toxicity with respect to their polarity and their scavenging properties. We did some collaboration work with microbiologist and biochemists.

I bought thirty two (32) albino mice for use in the anti-hepatoprotective studies with the extracts and isolates. The biochemical parameters such as aspartate aminotransferase (AST), Urea, gamma-glutamyl transferase (GGT), alanine transaminase (ALT) etc. were all used to assess liver function. Studies showed that the moderately polar extracts exhibited the higher activities in comparison to other extracts. In microbiology department, I worked with a scientist/microbiologist, who showed me procedures to carry out antifungal and antibacterial tests on the plant extracts. We did the tests together, using different concentration and polarity of extracts. We found that the antimicrobial activities were affected by concentration and polarity of plant extracts, but the plant essential oils did not show any activities. With the antihepatoprotective and antimicrobial activities, the isolates have ability to be developed and used in pharmaceutical industries.

The publication in Cell membranes and free radical research, Academia arena and West Indian Medical Journal is because the investigated plant is biologically important, and can benefit the readers in such field with the approach we applied in our studies.

- b) The flame retardant studies published in the American Chemical Society, Journal of Physical Chemistry B shows the importance of using X-ray tomography and interferometry imaging techniques in materials science. The imaging method used to study flame-retardants revealed the internal structures across different formulations. The flame retardant polymer blends were prepared by Albemarle Corporation (flame retardant manufacturing company). We did flammability test with the Underwriters Laboratory (UL 94 vertical burn test) to initially assess the flame inhibition of different blends. With our collaborators at Louisiana State University Center for Advanced Microstructures and Devices, and Argonne National Lab, we acquired the tomography and radiography data together. One novel and fascinating research we did at Advanced Photon Source is to acquire the flame retardant data sets while burning the samples. This is a real time experiment we thought it gives accurate measurement for understanding flame retardant performance. In addition, we also performed tomography of postburn samples. The burnt and unburnt samples were compared and contrasted in the studies.

After data acquisition, I performed the 3D reconstruction using wolfram Mathematica with MATLAB and visualized the data sets using visualization software such as FEI Avizo, ImageJ, LLNL VisIt and ParaView. From the visualization, analysis and inferences were made to understand why some flame retardant samples are effective while others are not. I wrote the manuscript and submitted to my PhD advisor, Prof. Leslie G. Butler for editing. After his final edit, it was sent to Albemarle Corporation for approval, eventually sent out for publication. The flame retardant for this publication is Saytex-8010.

- c) Due to some environmental issues, Albemarle Corporation developed another flame retardant, which was considered environmentally friendly, safe and economical. This is a polymeric flame retardant, called GreenArmor. I burnt the samples and I acquired X-ray imaging experiments for analysis. It was found that this flame retardant blended well, good homogeneity with the used polymer, high impact polystyrene. We also quantified some lumps (unblended) antimony (III) oxide as synergist in the polymer blend. I wrote the manuscript, submitted to my boss for his edit and approved by the company for publication. This is submitted to Royal Society of Chemistry, Soft Matter. This will benefit the readers in the flame retardant research field on optimizing the formulation and performance.

III. Applicant's Statement

- a) **Research experience:** Based on my achievements in graduate schools (University of Ibadan and Louisiana State University), I have gained ability with experience to be successful in interdisciplinary research. I have research ideas in medicinal chemistry as well as X-ray imaging experiments. The X-ray methods are extremely useful ranging from materials science (polymer additives, oil sands, nanoparticles etc.) to biological samples. I taught chemistry classes (organic and inorganic chemistry) at Kwararafa University, Nigeria before coming to USA in August 2011 for PhD studies. With the knowledge of X-ray imaging in polymer blends, I have also used the laboratory X-ray grating interferometry to image mice brown and white fats treated under various temperatures (10, 24 and 36 °C) to study obesity. This is the current research I am exploring after my PhD dissertation defense in flame retardant. This is in collaboration with Pennington Biomedical Research Institute. I like exploring new and promising research using my experience, skills and knowledge.

- b) **Relevant activities:** During BSc program, I was a member of the Students Academic Committee, we organized tutorial classes to teach junior fellows at University of Ibadan for better academic performance. Because of my contributions, I was well known in department of chemistry, given a nickname “Professor”. I enjoyed the moment because I love contributing to people’s lives in a positive way. I was also elected as the sport director of the Students Chemical Society of Nigeria, Department of Chemistry. During school break, I used to organize coaching classes at home to help high school students in science subject such as mathematics, chemistry and physics. After graduation, I served at University of Uyo, Akwa Ibom State, Nigeria as a graduate assistant. I was assigned to proctor and grade examination papers. In addition, I was given an office in the chemistry library to coordinate the borrowing/returning of chemistry textbooks for students. For extra activity, I was a Provost Marshal (2007-08) for the national youth service corps, federal road safety commission, Akwa Ibom State. We worked with federal road safety staff during a year service as required by the Nigeria government.

At Louisiana State University, LSU, I teach general chemistry labs, proctor exams and grade test and exam papers. I was once a solution assistant for two semesters. I have also volunteered in some activities such as Super Science Saturday, LSU Fall Fests, and orientation leader during LSU International Students Orientation etc. Aside conferences where I presented our research work, I have given organic and inorganic research and literature talks at Louisiana State University.

- c) **Special circumstances:** Working on a project in collaboration with industry sometimes times a long time to have publications. The first publication I had at Louisiana State University took more than four months for the company review for approval. The second one took over three months for review. In addition, due to busy schedule of my boss to edit the manuscripts, it requires a long period of time to get publications. Things are in the right order now, and hopefully, I will get at least three papers out of PhD program.

I have successfully defended my PhD dissertation on May 16, 2016. I am just finishing up with minor corrections from the committee members and the graduate school.

I am hoping to be considered for the visiting fellowship program to contribute my part for further research and development in Natural Resources Canada in Advanced Combustion Technology.