

Professor Rabi Ann Musah Awarded Three-year Grant for Investigations of the Environmental Fate of Plant-derived Organosulfur Compounds

Professor Rabi Ann Musah, Department of Chemistry, has been awarded a three-year \$410,000.00 grant from the National Science Foundation for her research project “Plant-derived Biogenic Sulfur Emissions and the Environment”.

Background

The biogeochemistry of volatile organosulfur compounds (VOSCs) has been the focus of significant attention because of increased awareness of their contribution to atmospheric sulfur, and hence their potential to influence global climate. Thus, several attempts have been made to develop a global sulfur cycle that adequately defines the sources and fates of these sulfur compounds. In this regard, terrestrial contributions to the makeup of environmental VOSCs represent the greatest uncertainty. In particular, sulfur gas flux from living vascular plants to the atmosphere is an important but little studied part of the global sulfur cycle, and the products of reactions of these compounds with environmentally relevant free radicals remains unknown. Compounding this problem is the fact that analytical methods used for VOSC analysis may introduce artifacts, which lead to inaccurate assessments of the makeup of emitted compounds. This, in turn, makes it difficult to assess the contributions that such emissions make, and the influence they may have on the environment and climate.

Project Goal

The goal of Dr. Musah’s work is to begin to address the aforementioned issues through pursuit of the following specific aims: (1) Identification of VOSCs emitted by forest and/or agriculturally important plants, and optimization of the analytical methods used for their detection using mass spectrometry under “soft” ionization conditions; (2) Identification of the products and determination of the kinetics of the reactions of vascular plant-emitted VOSCs with atmospherically relevant radical species such as ozone, hydroxyl and nitroxyl radicals; and (3) Design and development of an ambient air analysis platform that interfaces with available mass spectrometric instruments to permit detection of plant-emitted VOSC’s in air in real time.

Project Broader Impacts

This research will facilitate the study of not only the fates of plant emitted VOSCs, but also the extent to which they may ultimately contribute to the overall atmospheric sulfur burden, and influence pollution, acid rain, and cloud formation, among other phenomena. The developed analytical tools would be commercially available and find broad utility for analyses relevant to a range of other fields including chemistry, biochemistry, forensics chemistry, food sciences, agriculture, and medicine.