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GC-MS-Application and instrumentation challenges in Eastern Africa

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The availability and usage of analytical instrumentation is steadily improving in research, private and institutional laboratories within the Eastern African region. It is critical for governments and institutions to make decisions on developmental areas (e.g. millennium development goals on health, food security, water and industrialization etc) using analytical data from validated methodologies using best available instrumentation. The current level of GC-MS instrumentation in public universities, government and private laboratories, with highlights on state-of-art equipment, will be discussed. Challenges in acquisition, installation and routine usage of gas chromatography-mass spectrometry (GC-MS) instrumentation in Eastern Africa region will be presented. With the support of Pan-African chemistry Network and The Royal Society of Chemistry, training workshops have been held in the region for GC-MS users. Lessons learnt through these workshops will be discussed. The experiences and current application of GC-MS with examples such as analysis of organic pollutants in water, profiling of honey from different origins, and organic contaminants in vegetables are available in Kenyan market. Suggestions on the way forward for advancement of GC-MS and MS in the region will be presented.

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Atmospheric pressure helium plasma ionization mass spectrometry (HePI-MS)

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Some ambient-ionization techniques have revolutionized direct sample analysis by mass spectrometry because the need of a solvent spray can be eliminated. Recently described Helium-Plasma Ionization Mass Spectrometry (HePI) has been recognized as one of the promising novel procedures for ionizing a variety of organic and inorganic compounds. Under positive-ion generating HePI conditions some molecules undergo protonation [$(M + H)^+$] while others generate molecular ions ($M^{+\bullet}$). Our recent results show that the formation of molecular ions or protonated molecules can be swung back and forth in a controlled manner. By manipulating the atmosphere surrounding the source, we can generate molecular ions from aromatic hydrocarbons, and virtually eliminate the protonated species. The ionization is effected by a direct Penning mechanism due to interactions of the gas-phase analyte with meta stable helium atoms. However, when the ambient gases bear even traces of moisture, the analytes are ionized by proton transfer reactions with gaseous H_3O^+. We demonstrate that by controlling experimental conditions, the abundance of molecular ions and protonated molecules in a HePI source can be manipulated.

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