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Separation and Pre – Concentration of Metal Cations – DNA/RNA Chelates Using Molecular Beam Mass Spectrometry with Tunable Vacuum Ultraviolet (VUV) Synchrotron Radiation and Various Analytical Methods

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Separation and pre–concentration procedures such as Liquid–Liquid Extraction (LLE), Solid Phase Extraction (SPE) and Homogenous Liquid–Liquid Extraction (HLLE) make it feasible to determine the trace of metal cations such as Mg^{2+}, Ca^{2+}, Cr^{3+}, Mn^{2+}, Fe^{3+}, Co^{2+}, Co^{3+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, Se^{2+}, Mo^{6+}, Ru^{4+}, Rh^{3+}, Pd^{2+}, Ag^{+}, Cd^{2+}, Sn^{2+}, Te^{2+}, Te^{4+}, Hg^{2+} and Pb^{2+} in natural samples using molecular beam mass spectrometry with tunable Vacuum Ultraviolet (VUV) synchrotron radiation (Figure 1) and various analytical methods [1-21]. Pre–concentration methods generally improve sensitivity and selectivity of the analysis with the additional advantage of isolation the analyte from the interfering compounds [22,23]. In the recent years, Homogenous Liquid– Liquid Extraction (HLLE) using molecular beam mass spectrometry with tunable Vacuum Ultraviolet (VUV) synchrotron radiation and various analytical methods has been extensively used in sample preparation due to speed, suitable performance, higher concentration factor and less solvent consumption in comparison with Liquid–Liquid Extraction (LLE) and Solid Phase Extraction (SPE) [24-44].

In the present editorial, an effective method is presented for pre–concentration of Mg^{2+}, Ca^{2+}, Cr^{3+}, Mn^{2+}, Fe^{3+}, Co^{2+}, Co^{3+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, Se^{2+}, Mo^{6+}, Ru^{4+}, Rh^{3+}, Pd^{2+}, Ag^{+}, Cd^{2+}, Sn^{2+}, Te^{2+}, Te^{4+}, Hg^{2+} and Pb^{2+} by Homogenous Liquid–Liquid Extraction (HLLE) and using molecular beam mass spectrometry with tunable Vacuum Ultraviolet (VUV) Synchrotron radiation and various analytical methods.

For this purpose, Mg^{2+}/ Ca^{2+}/ Cr^{3+}/ Mn^{2+}/ Fe^{3+}/ Co^{2+}/ Co^{3+}/ Ni^{2+}/ Cu^{2+}/ Zn^{2+}/ Se^{2+}/ Mo^{6+}/ Ru^{4+}/ Rh^{3+}/ Pd^{2+}/ Ag^{+}/ Cd^{2+}/ Sn^{2+}/ Te^{2+}/ Te^{4+}/ Hg^{2+}/ Pb^{2+} -DNA/RNA chelates are formed by the reaction of the Mg^{2+}, Ca^{2+}, Cr^{3+}, Mn^{2+}, Fe^{3+}, Co^{2+}, Co^{3+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, Se^{2+}, Mo^{6+}, Ru^{4+}, Rh^{3+}, Pd^{2+}, Ag^{+}, Cd^{2+}, Sn^{2+}, Te^{2+}, Te^{4+}, Hg^{2+} and Pb^{2+} with DNA/RNA and separated by Homogenous Liquid–Liquid Extraction (HLLE) in the water–acetic and acid–chloroform ternary solvent system using molecular beam mass spectrometry with tunable Vacuum Ultraviolet (VUV) synchrotron radiation and various analytical methods. Homogenous Liquid–Liquid Extraction (HLLE) conditions are optimized by evaluating the effective factors in extraction such as pH, ligand concentration and masking agent. By using molecular beam mass spectrometry with tunable Vacuum Ultraviolet (VUV) synchrotron radiation and various analytical methods, pre–concentration factor more than hundred was achieved. The calibration graph was linear over the extended range with good, acceptable and reasonable correlation coefficient (Figure 2).

Figure 1: Schematic of molecular beam mass spectrometry with tunable Vacuum Ultraviolet (VUV) synchrotron radiation [1-13].

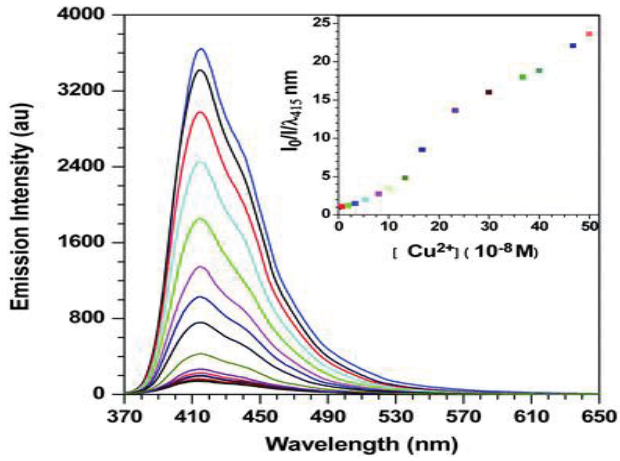

Figure 2: Calibration graph of Cu^{2+} - DNA/RNA chelate.

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