Development of an Assay Method for Zirconium Based on Chemiluminescence

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Analytical Chemistry: Development of an Assay Method for Zirconium Based on Chemiluminescence Andrew Zhang Norman North High School, Norman, Oklahoma, United States Abstract Purpose: To develop a simple, low-cost, selective, and sensitive chemiluminescence(CL) assay method for Zr(IV) Procedure: Zr solution was injected into a mixture solution of luminol-H2O2-ascorbic acid. The produced CL was recorded by a photomultiplier tube. The effects of various parameters, including luminol, hydrogen peroxide , ascorbic acid, and NaOH concentrations, diluent amount, composition, pH, and other metal cations, were systematically investigated. Results: In general, the CL intensity increases with the reactants concentrations, such as luminol, ascorbic acid concentration. However, there are optimal concentrations of NaOH and H2O2, beyond which the CL intensity decreased. Additionally, an optimal PH for diluent was identified, further influencing the efficiency of the CL reaction. Under the optimal conditions, CL intensity is proportional to the log(Zr concentration) from 39 to 3945ug/mL. No CL was observed with other metal cations, such as Na+, K+, Ag+, Zn^{2+}, and In^{3+}. Conclusion: Based on these results, a simple, cheap, highly selective, and sensitive assay method for Zirconium(IV) was successfully developed, offering potential applications in environmental and industrial monitoring.

Awards Won: