# Conference Report

## Sixth International Symposium on Resonance Ionization Spectroscopy and Its Applications: May 24–29, 1992, Santa Fe, New Mexico, USA

The Sixth International Symposium on Resonance Ionization Spectroscopy and Its Applications (RIS-92) was held in Santa Fe, New Mexico, USA, from May 24 to 29, 1992. The host Institution was the Los Alamos National Laboratory, under the Auspices of the University of California and the United States Department of Energy. Dr. C. M. Miller (LANL) served as Co-chairman of the Symposium, whose series is coordinated, as in the past, by the Institute of Resonance Ionization Spectroscopy of the University of Tennessee, under the leadership of Dr. J. E. Parks, who acted as the other Co-chairman of RIS-92.

### Scientific Programme

In accordance with the previous meetings (the series started in 1981 in Gatlinburg, TN, USA), the scientific flavour of RIS-92 was devoted to the theory and applications of the photoionization technique in different atomic and molecular reservoirs and with different tunable laser sources. Ten scientific sessions (see below) were arranged, with over 50 contributions (Plenary Lectures, Invited Lectures and Oral Presentations). In addition, two Poster Sessions were presented, each displaying about 20 contributions.

The Plenary Lectures were given by P. Lambropoulos, University of Southern California and University of Crete (The Never-Ending Richness of Resonance Ionization), G. Tölg, Institute of Spectrochemistry and Applied Spectroscopy, Dortmund (Limitations of Extreme Trace Analysis from the Standpoint of Analytical Chemistry), V. S. Letokhov, Institute of Spectroscopy, Troitsk, Moscow (Towards Laser Resonance Ionization Photoelectron and Photoion Spectroscopy), N. Winograd, University of Pennsylvania (Prospects for Submicron Molecular Imaging with Ion Beams and Lasers) and A. Mooradian, MIT, Boston, MA (Precision Frequency and Tunable Lasers for Spectroscopic Applications).

Invited Lectures were given by J. Crawford (Montreal, Canada), H. Backe (Mainz, Germany), B. Bushaw (Richland, WA, USA), H. Hotop (Kaiserslautern, Germany), T. F. Gallagher (Charlottesville, VA, USA), W. R. Garrett (Oak Ridge, TN, USA), N. Omenetto (Ispra, Italy), M. G. White (Upton, NY, USA), M. Pellin (Argonne, IL, USA), G. I. Bekov (Troitsk, Moscow, Russia), D. von der Linde (Essen, Germany), S. W. Downey (Murray Hill, NJ, USA), B. Dubreuil (Orleans, France), R. A. Keller (Los Alamos, NM, USA) and H. Ravn (Geneva, Switzerland).

In the following overview of the meeting, we have tried to emphasize some applications of RIS, with special emphasis to the analytical aspects of the presentations.

As clearly pointed out by Sam Hurst in his Keynote Address, the development of RIS has been such that many of the application anticipated in the early meetings have now been met. On the other hand, some applications are still under development, and pleasant surprises can be welcomed, notably in molecular RIS and accelerator based studies of very rare isotopes, which were not anticipated a decade ago. A similar concept was echoed by P. Lambropoulos who entitled his lecture "The Never-Ending Richness of RIS". This certainly testifies to the continuous effort of many researchers active in the field of atomic and nuclear physics, material sciences, biology and environmental analysis.

Contributions were arranged in the following Scientific Sessions: Ultrasensitive Applications; Atomic Spectroscopy; RIS Dynamics; Laser Techniques in Flames and Plasmas; Molecular RIS; Analytical Applications; Surface and Bulk Analysis; Biological and Medical Applications; and Sources and Techniques.

Challenged as being capable of single atom detection, the photoionization technique has already reached in many cases extremely high sensitivities and selectivities. For example, detection limits below hundred atoms have been achieved in the case of noble atoms with a second generation RIS-time-of-flight instrumentation (Thonnard *et al.*, Atom Sciences Inc., Oak Ridge, TN, USA), while Bushaw (Pacific Northwest Laboratory, Richland, WA, USA), using continuous wave RIMS, has shown detection limits in the attogram range for important radioisotopes, namely for $^{210}$Pb, which is an indicator of integrated radon exposure, and $^{90}$Sr, because of its high yield in nuclear power generation. One drawback, related to the use of pulsed lasers, is that the duty cycle offered by most systems is very low, which means that the probing time, *i.e.*, the time spent by the atomic/molecular target in the laser beam, is rather small. This is often alleviated using synchronized vaporization. A very intriguing approach to the solution of this problem is the use of "trapping" techniques, which can retain the target for a long time in the interaction volume. The use of a radiofrequency quadrupole trap, suitable for the radioactive isotopes produced by nuclear accelerators, was described by Crawford.

Another drawback of the RIS technique, when compared with other spectroscopic techniques such as plasma emission and plasma mass spectrometry, lies in its inability to perform multi-element analysis on a simultaneous basis. Bekov discussed the possibility of multi-element analysis, in which several (up to five) dye lasers can be operated on a rapid sequential basis by a fast-acting scanner device (3–5 ms) allowing the simultaneous detection of three or more elements in a sample. This approach would be useful to other laser-based methods, such as fluorescence.

It is clear that the development of ultra-sensitive methods is justified by the expanding needs of chemical analysis, when for example the microdistribution of particular elements in tissues or body fluids imply that only minuste sample amounts are available. However, whenever such extremely low detection limits are reached, the question arises about their significance from the point of view of analytical precision and accuracy. As clearly stressed by Tölg, the occurrence of systematic errors rapidly increases with decreasing concentrations and their recognition is very difficult, if sometimes not impossible. This is a fundamental problem which is faced by every technique of chemical analysis, including RIS and other laser-based methods. Real detection limits are limited by the blank values, which must be evaluated for the entire analytical procedure and not simply as the last measurement step.

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**Dielectrics in Electric Fields** Gorur Govinda Raju,2017-07-28 Dielectrics in Electric Fields explores the influence of electric fields on dielectric i e non conducting or insulating materials examining the distinctive behaviors of these materials through well established principles of physics and engineering Featuring five new chapters nearly 200 new figures and more than 800 new citations this fully updated and significantly expanded Second Edition Analyzes inorganic substances with real life applications in harsh working conditions such as outdoor nuclear and space environments Introduces methods for measuring dielectric properties at microwave frequencies presenting results obtained for specific materials Discusses the application of dielectric theory in allied fields such as corrosion studies civil engineering and health sciences Combines in one chapter coverage of electrical breakdown in gases with breakdown in micrometric gaps Offers extensive coverage of electron energy distribution essential knowledge required for the application of plasma sciences in medical science Delivers a detailed review of breakdown in liquids along with an overview of electron mobility providing a clear understanding of breakdown phenomena Explains breakdown in solid dielectrics such as single crystals polycrystalline and amorphous states thin films and powders compressed to form pellets Addresses the latest advances in dielectric theory and research including cutting edge nanodielectric materials and their practical applications Blends early classical papers that laid the foundation for much of the dielectric theory with more recent work The author has drawn from more than 55 years of research studies and experience in the areas of high voltage engineering power systems and dielectric materials and systems to supply both aspiring and practicing engineers with a comprehensive authoritative source for up to date information on dielectrics in electric fields **Physics Briefs** ,1991 **Report of the Annual Meeting** British Association for the Advancement of Science. Meeting,1905 **INIS Atomindex** ,1986 U.S. Government Research & Development Reports ,1970 *Current Technical Papers* ,1957 **Optics and Spectroscopy** ,1962 **Optics Letters** ,1977 **Indiana Union List**

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