EXECUTIVE SUMMARY

During the last two years since the first Euroconference and NEA Workshop on Speciation, Techniques and Facilities for Radioactive Materials at Synchrotron Light Sources, Actinide-XAS-98, the number of studies on radionuclides and actinides in particular using synchrotron radiation techniques has grown significantly. This is due to the unique properties of synchrotron radiation to provide intense X-ray photons that enable an increasing variety of experiments for obtaining molecular-level information on radionuclide/actinide species. Fundamental knowledge of radionuclide speciation is essential for understanding and predicting the behaviour of these hazardous elements in the environment, for risk assessment of nuclear waste storage, remediation of contaminated sites and development of effective separation technologies. Other important fields, where synchrotron radiation is a powerful tool, are radiopharmaceutical chemistry and general actinide chemistry and physics.

For this reason, the second Euroconference and NEA Workshop Actinide-XAS-2000, which was held in Grenoble, France, from 10-12 September 2000, focused on the scientific progress made in these areas since the Actinide-XAS-98 meeting. Numerous newcomers among the over 70 participants from 10 European countries, USA, Japan and Australia had the opportunity to learn about the type of information that can be obtained using synchrotron radiation from the examples given in the invited lectures. Twenty-four (24) graduate students and post-graduate students benefited from TMR and INCO fellowships by the European Commission.

The meeting was organised into three sessions with 30 oral talks and one evening session with 27 poster presentations. On the first day, G.E. Brown, Jr. opened the session "X-ray Absorption Spectroscopy of Radionuclides" by introducing the US research concept of molecular environmental sciences. His specific examples focused on the near- and medium-range co-ordination environment around the actinides on mineral surfaces and in silicate glass melts. The talk underlined the effects of anharmonicities on distances and co-ordination numbers determined by EXAFS and demonstrated the usefulness of Pauling bond valence theory for the construction of plausible structural models. C. Madic presented EXAFS investigations on the structure of trivalent lanthanide and americium solution complexes that are relevant to extractive separation of minor actinides from nuclear waste. P.G. Allen discussed anomalous background absorption effects and the influence of electronic structure on the XANES of solid actinide metals and oxides. The calculation of and comparison with experimental K-edge XANES spectra of several transition metal compounds, including technetium, with octahedral and tetrahedral symmetry were presented by V.L. Kraizman. Quantum chemical calculations of uranium(VI) species in aqueous solution and comparison of their metrical parameters with those from EXAFS measurements were given by S. Tsushima. L. Soderholm reported on EXAFS data and *ab initio* calculations on Np(VI) and Np(VII) species in alkaline solution. Related to radioactive waste disposal, F. Farges presented *in situ* XAFS studies on metals in silica melts over an extended temperature range. Molecular-level information on the sorption of thorium(IV) on montmorillonite and of uranium(VI) on zircon and zirconia were presented by R. Dähn and C. Lomenech, respectively.

The second day and part of the third day were devoted to "Application of Synchrotron Radiation Techniques and Complementary Techniques". In the first lecture in this session, D.K. Shuh discussed several experimental techniques available for actinide research at the ALS in the vacuum ultraviolet

(VUV)/soft X-ray region, i.e. X-ray photoelectron spectroscopy, NEXAFS spectroscopy and X-ray emission spectroscopy. J. Susini gave an overview of the experimental possibilities and applications of X-ray microscopy in the energy range of 2-10 keV at the ESRF. M. Drakopoulos and B. Salbu presented the principle of synchrotron X-ray microprobe and its application to the speciation of uranium particles, respectively. The characterisation of environmental particles was also the subject of the talk given by M. Betti. As techniques, which are complementary to synchrotron radiation, she applied secondary ion mass spectrometry and nuclear track methods to study particles containing actinides. Several presentations in this session were devoted to new results of XAFS investigations on actinide interactions with bacteria (C. Hennig) and humic substances (M.A. Denecke), of environmental plutonium samples (D.L. Clark), plutonium colloids and alloys (S.D. Conradson) and actinide complexes with hexacyano metallate ions (I. Bonhoure). Yu.A. Babanov introduced the Tikhonov regularisation method as an important alternative to the standard EXAFS analysis methods based on least-square fits. The investigation of X-ray magnetooptics in lanthanides, the pressure behaviour of actinides and the electronic structure of thin actinide films were the topics of talks given by K. Starke, R.G. Haire and T. Gouder, respectively.

In the final session entitled “Present and Future Synchrotron Facilities for Radionuclide Studies”, experimental stations available or planned for actinide research were presented: ALS (D.K. Shuh), APS (L. Soderholm), ESRF-ROBL (T. Reich), SSRL (G.E. Brown, Jr.), HASYLAB (E. Welter), ANKA (M.A. Denecke) and SOLEIL (C. Madic). After these oral presentations, the participants used the opportunity to visit several beam lines at the ESRF including BM 20 (Rossendorf Beamline for radiochemistry and materials research), ID 21 (X-ray microscopy) and ID 22 (X-ray fluorescence microprobe).

During the three days of Actinide-XAS-2000, both the quality and the number of new results in the field of radionuclide/actinide research using synchrotron radiation was impressive. Both the experts in the field and the large number of young scientists benefited from this excellent opportunity for scientific discussion and teaching. New projects for scientific collaborations were discussed. It was, therefore, suggested to keep convening this meeting every two years.